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In Three Sections
Section 1

Return on Investment

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Costs and Pricing Policy

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Industry Studies

Textile Costing Practices

Industrial Research Accounting

Land Development Accounts

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An Approach To Internal Profit Measurement

by JOEL DEAN

IN THIS PAPER, I am going to try to approach a group of very concrete problems of internal profit measurement and evaluation in a typically academic way, which means a roundabout way starting from first principles. The justification for such an approach, if it has any, is that it sometimes leads to the most heretical kinds of conclusions, but conclusions which turn out to be more sensible than anyone might have suspected at the start. For example, one of the heresies I hope to persuade you of is that precise measurement of internal net profit is quite impossible. I hasten to add that this and any other heresies we may encounter are offered in the hope that they will contribute to raising internal financial measurement and evaluation to the high positions we all think they deserve in management's array of modern administrative techniques.

Objectives of Internal Profit Measurement

Let us start our investigation by setting down what seem to me to be the two main objectives of a system of internal financial measurement. These are, first, the guidance of the division or other internal managements whose results are being measured and, second, the assistance of top management and its staff in their tasks of appraising and guiding divisional performance.

Many view the second of these objectives, namely, measuring divisional performance, as if it were the only one or at least the more important of the two. Our firm's experience inclines me to believe that most companies' profits are affected at least as much by the influence of a measurement system on the day-to-day behavior of division management as by the assistance these measurements give to top management later on. But there is no need to argue which of these objectives is the more important in any particular case if we can agree that both are certainly important enough to be taken into account in setting up an internal measurement system. And, aside from such usually desirable characteristitcs as simplicity, these are the *only* objectives of a measurement system. We can,

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therefore, appraise any particular measurement system or some feature of such a system by answering little more than these two short questions:

1. Does it assist division management in making business decisions in ways that will maximize the company's profits?
2. Does it give top management a reliable summary of the financial record of each division's performance?

Irrelevant Criteria

By contrast here are two questions that need *not* be asked about an internal financial measurement system:

1. Would the division results qualify as a conventional set of financial statements?
2. Does the internal performance measurement correctly show the division's net profits?

The first question need not be asked because we are not concerned here with how the reports might look to a tax collector or an uninformed outsider. One of the objects of the present form of conventional accounting statements, the kind that appears with the auditing firm's letter somewhere in the back of the annual report, is to protect stockholders against any arbitrary and possibly misleading manipulations of the books of account by management. They do this by guaranteeing that none of the traditional costs are overlooked, that objective methods of dealing with such hard-to-guess costs as annual depreciation are rigorously applied throughout, that no profits are shown until there has been a sale to a genuine outsider, etc.

The situation is very different where reports are made exclusively for insiders who may be presumed to be intelligent, informed and able to follow up or supplement these reports through personal investigation or staff work. Here we are free from the restraints of tradition, stockholder ignorance or the Securities and Exchange Commission. Management can, therefore, decide just what information it wants or does not want and how it is to be presented.

For example, unrealized profits can and often should be included in divisional profit measurements. The fact that no sale took place to outsiders and that the price of the internal transfer was determined by company executives rather than directly by market forces would disqualify the transaction for auditors' certification, but this is an irrelevant criterion for managerial use.

The treatment of inventory values and materials costs can well be quite different where managerial accounting is the object. Whether or not the company uses "lifo" in its stockholder and tax accounting, some system for costing mate-

rials on a replacement basis can often help division management and top management make better decisions. And, even if the company does use "lifo" for other purposes, managerial accounting objectives may require explicit recognition of inventory gains or losses where these are an important part of the responsibilities of division management.

As a final example, divisional financial measures can depart from the conventional kind in their treatment of depreciation charges and the net property accounts, which can be adjusted to reflect changing general price levels or windfall gains and losses in the market values of particular assets. In some cases, they might even be altered to record the division's investment in such things as research or a long-range advertising program, even though tax wisdom and the dictates of conservative stockholder accounting call for expensing these items on the regular books of account.

I am not saying that all of these things should always be done or that they are always easy to do, but I do say we should feel free to do them and that there are many cases where they *should* be done, both in order to give the right kind of guidance to division management and to permit top management to make the right kind of evaluation. Further, I am confident that they *can* be done well enough to be worth doing in such cases. Perhaps this is a heresy, but you will see that it is an old one if you will think back to the days before widespread securities ownership and the Federal income tax. In those days, owner-managers had their financial reports made up to suit themselves, and they often did such things as ignoring formal depeciation charges altogether, out of a belief that their own informed judgment was as reliable as any other guide to what the business was worth and how fast the fixed assets were losing economic value. Thus we need not be disturbed by the fact that internal profit measurements would not qualify for certification by independent auditors.

The second question we do *not* need to ask about an internal financial measurement system is: does the internal performance measurement correctly show divisional net profits? The word 'profits' always seems to imply that the division financial measurement system should somehow apportion all the corporation's revenues and costs, especially the costs, to the divisional income statements. I suppose that the real reason for this is top management's worry that the divisional managers will not work hard enough unless they are exposed to the full, staggering burden of corporate overheads. It certainly seems reasonable that division managers should not be led to believe that the corporation's profits are any higher than they really are. I suggest, however, that the internal financial measurement system will usually work better if, instead of going to all the work of trying to calculate something like a traditional "net profit" for each division,

we settle for a more simple and reliable measure. In fact, I doubt whether any routine divisional net profit computation along traditional full-cost lines can ever mean anything useful to either the divisions or top management.

Decisions of Division Managers

Consider first the system's function in guiding the decisions of division management. Division management ought to have the clearest possible understanding in advance as to just how its performance is to be measured. If anybody tells them, they will guess, because executives have strong incentives to maximize whatever they think will be given the most weight in the corporate scoring system, whether this be divisional earnings, a clean desk or low golf score. It is inevitable and desirable that a corporate decision to rely heavily on financial performance measures will be reflected in the myriad of day-to-day decisions made by the division.

For the most part, these are business decisions between alternative ways of doing something. One example is make-or-buy; another might be the choice between a policy of occasional expensive overtime operation versus one of steady production. Steady production would incur the cost of either higher peak inventories or more frequent out-of-stock situations. For all these decisions, the financial criterion that the company wants the division manager to apply is that of maximizing company profits. But, so far as the division manager is concerned, he will make his decisions correctly if he maximizes something a good deal simpler, which we can call his operating result and define loosely as a dollar measure that takes no account of any costs beyond the division's current ability to control.

Examples of such uncontrollable costs might include the president's salary or office rent, the expenses of defending an antitrust suit, and perhaps even the annual depreciation charge on the division's own plants. The allocations and reallocations of costs such as these take time and can generate many arguments that serve only to undermine confidence in the measurement system at all levels. These allocations serve absolutely no purpose in helping a division manager with the current economic or managerial decisions he has to make. He cannot change them by any constructive action he can take. Moreover, the mere fact that he may succeed in covering whatever portion of these costs may have been allocated to him, should not be a cause for self congratulations or any lessening of effort on his part. Clearly, the division does not benefit from a system of internal profit measurement that aims at showing conventional net profits at the division level.

Appraisal of Division's Performance

If we turn now to the system's functions of giving top management a basis for financial appraisal, I think we find an even stronger case for avoiding the usual net profit concepts. After all, the president knows what his own salary is and how it is determined. Of what help is it to him to see how somebody thinks it ought to be spread over the various divisions? So it is with such expenses as those of a major antitrust suit. The corporation certainly would like the earnings of its divisions to cover these, but that desirable state of affairs will not be made any more likely by allocating them to divisional profits and losses. Instead, allocations of such corporate costs only get in the way of evaluating divisional performance. They attribute costs to the divisions over which the divisions have no control and which will not be affected by any remedial action that top management can possibly direct at the divisions. In addition, the inherent instability of most systems for allocating such costs impairs the validity of any historical review of annual division results, since good and bad years can be leveled out or interchanged by the way the allocations fall. One of the lessons we can learn from the best outside security analysts is that a long historical perspective can be valuable in appraising the current status and prospects of a complex economic unit. Most good analysts prefer to work with simple and consistent data and to make their own special adjustments instead of accepting those they find in the published reports.

In setting up a system of profit center performance measurement, we are striving for the benefits of breaking the company up into a number of small firms. We wish to secure the advantages of a small firm, and to:

1. Associate responsibility and control
2. Increase flexibility of profit center management
3. Stress competitive instead of political skills

At the same time, it would be well to remember that profit centers are not really small companies; if they were, there would be no point in holding several of them together under one corporate roof. This must mean that the important economic advantages of the profit center system will entail some joint costs incurred by the parent corporation in the interests of more than one division. It usually means that some restrictions will be imposed to prevent individual profit centers from behaving with complete independence in every case. Many of the financial effects of these joint costs and common policies cannot be allocated to the division in any sensible fashion. They need not be allocated for the profit centers to operate smoothly. In fact, if they are allocated, they are likely to dis-

tort the primary functions of the profit center.

This does not mean that these items are not real or are not important. What it does mean is that they can best be attribued to the central office and top management. They are not pertinent for the purpose of the profit center's decisions and their impact on evaluation of the center is too complex to try to summarize by mere allocation.

Measurement Separate from Evaluation

It would be both useful and satisfying to be in a position to distribute fully and finally to the divisions every last dollar of corporate revenue and expense, to set an economically correct depreciation charge for each division, to determine a managerially correct capital charge and risk allowance for each division, to do all this routinely by the use of nothing but desk calculators and junior clerks, and thus to derive automatically a series of divisional profit and loss figures that has real meaning for top management. It would be even better if the resulting figure could be made to point infallibly toward the source of any particularly good or bad performance that occurred. Since it is impossible to do all of the things at once, we must continue to rely on top management's judgment for many important evaluations and decisions. Since that is so, however, we can at least recognize that measurement is often properly separated from evaluation of such a complex thing as divisional financial performance, and that the evaluation is likely to be better if the measurements are made without trying to prejudge the result of a management review. A well-made measurement system can help management to see clearly the financial aspects of what the divisions are like, what they have done and what they are doing. It cannot resolve but can only contribute to the managerial decision as to whether a particular division is doing as well as it can or should do, why this is so, and what, if anything, should be done about it. Security analysts, whose work offers so many interesting parallels elsewhere in our task of measurement and evaluation, have little to offer on this point, because the analyst's job is over when he has decided how much a security is worth. This is the point where management's job really begins, because top management's responsibility is to identify and help to improve upon unsatisfactory performance, to learn from and reward performance that is of high quality, and to keep the company moving toward areas of high promise.

Perhaps I can summarize the important points I have been trying to make by saying that the fullest potentialities of the developing science (or art) of internal financial measurement can best be realized by being willing to take a fresh look at our reasons for measuring divisional results and then trying to lay out a mea-

urement system with these unique purposes in mind, not merely by imitating some other currently used reporting systems that were originally devised at other times for other purposes. If I have judged these unique purposes correctly, it means that a good internal measurement system ought to aim at providing a well-ordered factual summary of current developments and their historical background, should make it as easy as possible for management and staff to arrive at their own evaluations of these facts and should recognize that a well-informed top management will derive little benefit from attempts to subsitute a number of conventional and routine calculations for their own good judgment.

Other Problems of Internal Profit Measurement

I am acutely aware that I have done no more than outline one phase of this fascinating and fast-developing problem of internal financial measurement. I hope that the approach sketched here will help you to grapple with such other important problems as these:

1. *Divisional boundaries*—Which activities should be grouped together in divisions and which should be made into separate divsions or put in service centers? How well division boundaries are drawn and redrawn to keep pace with changing circumstances can make the difference between a system of profit center decentralization that works and one that creates even more problems of measurement and control.

2. *Pricing internal transfers of goods and services*—Should transfer prices be freely negotiated by the buying and selling divisions or should they be subject to central supervision and control? Pricing of transfers can make profits for any one division high or low and the method of pricing can have profound effect upon divisional results and incentives. What is needed is a system that yields meaningful divisional measures, which means that transfer pricing policies are central to a successful divisionalization program.

3. *Capital management decisions*—How do you get good capital investment decisions without compromising the position of the profit center manager? This problem is vital, because the manager is usually thinking in terms of results for this year and next, whereas many investment decisions will affect results for the next five years, ten years or even more. One practical problem here is how top management can make sure that a division manager will not make unwise investments for the sake of dressing up his performance measure with short-run cost savings.

4. *Evaluation of divisional performance*—Are there practical ways for analysis to supplement top management's judgment in evaluating the performance of divisions and their managers? It would be desirable, for example, to arrive at an objective and supportable standard of rate-of-return for a particular division. Also needed is an estimate of the capital charge that adequately reflects allowance for capital wastage and risks of investment of a particular division in a particular year. Companies in cyclical industries may, in addition, need to stress ways of allowing for the fact that even the best-run divisions will experience wide earnings fluctuations from year to year.

5. *Executive compensation*—Should a part or all of the compensation of a division manger and his principal assistants be tied objectively to division performance as measured in the way that we have suggested? If so, should the relation be inflexible and objective or should it, instead, be subject to broad variations based upon top management's judgment of some of the factors that are not included in the measurement.

6. *Intangibles*—How can we simplify and inform top management appraisal of the intangible and hard-to-measure aspects of division performance? In the long run, it may be true that financial measurements tell the whole story, but in the short run, they clearly do not. Recognizing this, few companies are willing to ignore such aspects of division performance as its market share, its ability to keep its products abreast of new technological developments, and its performance in upholding the company's good name in dealing with the company's various publics. Any one of these imponderables can be sacrificed by a division manager with at least some short run improvement in his measured results. At least a part of an ideal measurement and appraisal program would recognize this possibility and try to take it into account.

7. *Relation of internal profit measurement to general accounting*—How far is it practical to go in building an effective internal profit center measurement system out of the same building blocks that already exist for computing the corporation's taxable income, reporting to stockholders, catching embezzlers, etc.? It would be wonderful if the entire internal measurement system could be built by simply rearranging the same data that are required for tax and stockholder accounting. Most companies will find, however, that there are important areas where this cannot be done without sacrificing basic objectives of internal performance measurement.

You may find that the approach outlined in this paper will help you in solving these and similar problems.

The Return on Capital Concept

by I. WAYNE KELLER

THERE IS NO ONE BASIS OF EVALUATION for internal profit appraisal. Effective management is the aggregate of many factors and each must be measured and appraised differently. However, management does need a common measure to appraise and compare the operating results of units of a company or its products, and to compare company results with those of other companies.

The common measurement for internal profit appraisal must reflect the effects of all factors required for successful operation. The traditional basis of comparison, per cent profit on sales, does not do this. It reflects only the price-cost relationship and ignores the amount of capital required to produce and distribute the products. Also, it is well known that the per cent profit on sales varies considerably among industries and also among products within an industry. The best common measure developed thus far for profit measurement and appraisal is the ratio of profit to assets—the return on capital employed.

RETURN ON CAPITAL EMPLOYED

$\frac{\text{Profit after Tax}}{\text{Net Sales}}$	=	% Profit on Sales	$\frac{\$\ 5,000}{\$100,000}$	= 5%
$\frac{\text{Net Sales}}{\text{Assets (Capital Employed)}}$	=	Turnover	$\frac{\$100,000}{\$\ 50,000}$	= 2
% Profit on Sales	x	Turnover	=	Return on Capital
5%	x	2	=	10%

EXHIBIT 1

The Return on Capital Formula

The return on capital is the result of two factors—(1) per cent profit on sales and (2) turnover (Exhibit 1). It is obvious that the return can be calculated by dividing profit by capital. To do so is to obscure critical factors which affect the

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rate of return. The per cent profit on sales shows the cost-price relationship. Turnover shows the dollars of sales per dollar of capital used. It measures the intensity at which capital is employed. To the extent to which a company can match the per cent profit on sales of a competitor and use its capital more effectively so as to have a higher turnover, it has a competitive advantage. If it can achieve both a higher profit on sales and a higher turnover, it has a distinct advantage for survival and growth.

This concept is gaining increased acceptance in business management. Mr. William B. Harris in "The Pressure on Profits" in the November, 1957 issue of *Fortune* states that "The delicate balance of these ratios is a key factor in corporate performance;" and "A business that produces higher and higher sales, while maintaining its operating-profit ratio, and at the same time utilizing its funds so well that it shows consistent increases in earnings on capital, is operating ideally."

Yield on Equity Differentiated from Return on Capital

The return on capital ratio is an internal measure of operating management. It is not necessarily a guide for equity investors. It is for this reason that the term "return on capital" is preferable to "return on investment" for internal use. "Investment" carries the connotation of equity capital rather than total capital.

The return or yield on investment has some limited value as an internal measure but it is primarily an investor's guide. In Exhibit 2, the yield on equity is determined under two assumed conditions—(1) with no interest-bearing debt and (2) with only half of the equity capital of (1) and the remainder of the funds provided by borrowing at five per cent. Here is shown the leverage factor, the ratio of assets to equity. With no debt the leverage factor is 1.25 and the yield on equity is 12.5 per cent. When interest-bearing debt is substituted for half of the equity capital, the return on capital declines because of the interest cost. However, the leverage factor becomes 2.5 and the yield on equity is increased to 22.5 per cent. To the extent that the equity interests are not jeopardized by excessive debt, this is a much more attractive situation for the stockholders.

The yield on investment, including the leverage factor, is a measure of financial management, not of operating management. Its internal use is in making comparisons with the financing methods of other companies and in guiding financial programs to the best advantage for the stockholders.

It will be noted in Exhibit 2 that the return on capital is reduced when borrowed money is substituted for half of the equity. This is due to the fact that,

YIELD ON EQUITY

	No Debt	Debt
Assets	$50,000	$50,000
Current Liabilities	$10,000	$10,000
Debt @ 5%	-	20,000
Equity	40,000	20,000
	$50,000	$50,000
Profit before Tax and Interest	$10,000	$10,000
Interest	-	1,000
	10,000	9,000
Tax @ 50%	5,000	4,500
Profit after Tax	$ 5,000	$ 4,500
Assets / Equity = Leverage	$50,000 / $40,000 = 1.25	$50,000 / $20,000 = 2.5
Return on Capital	10%	9%
Return on Capital x Leverage = Yield on Equity	10% x 1.25 = 12.5%	9% x 2.5 = 22.5%

EXHIBIT 2

for purposes of illustration, $20,000 of debt was substituted for an equal amount of equity. In practice, a business which borrows money expects to, and should, increase its operating profit by utilizing the funds so as to secure a return which is greater than the interest cost on the borrowed money.

Composition of Capital Employed

Having considered the yield on investment, let us return to internal profit measurement and appraisal and return on capital employed. Exhibit 1 indicated that assets and capital employed are synonymous in developing the ratio of return. For internal measurement the sources of the assets is unimportant. The significant question is how profitably they are being employed. A dollar provided by vendor credit should be used just as profitably as a dollar secured from the sale of stock.

There is wide divergence in practice as to the assets and their value used for determining return on capital. Personal experience has demonstrated that, when assets reflected in the published financial statements are used as the capital employed, at the company level, there is a ready acceptance of the figure. When other values are used, confusion is created which detracts from the true purpose and effective use of the ratios. For example, three bases are used rather widely for

fixed assets—(1) cost less provision for depreciation, (2) cost and (3) replacement value. The first is in agreement with the published financial statements and cannot be questioned on the grounds of being excessive.

When original cost is used, the reasons most commonly advanced are that (1) it is closer to replacement value than is cost less depreciation and (2) it tends to equate to a degree the investment in old and new facilities when ratios are determined for units or products of the company. It is to be emphasized that "closer" and "to a degree" are the key words of these reasons. Since the objectives are not being achieved completely, why inject debatable factors into the discussion? True, the cost of facilities has increased; but replacements or additions are seldom identical to the old ones. Efficiencies are incorporated into the new facilities which result in lower production costs. The favorable effect of these on the return ratio at least partially offsets the adverse effect on the ratio of higher capital costs. If fixed asset values are to be adjusted from depreciated value, is it not equally logical to adjust costs and profits for the effect of the age of the fixed assets? Also, at the company level, the depreciation recovered in the cost of goods sold has moved back into current assets and frequently on into investment in other fixed assets. If fixed assets are included in capital at cost, as shown on the balance sheet, there is a duplication of capital to the extent of the cumulative provision for depreciation charged against operations. It would follow that costs should then be adjusted to exclude depreciation. This becomes a complex and confusing procedure, and appraisal of the results is influenced by the validity of the adjustments.

When fixed assets are included in capital at replacement values, the reasons advanced for the practice are essentially the same as those given for using original cost, except that the qualifiers "closer" and "to a degree" are avoided. The arguments against using replacement values are the same as those against using original cost. Production costs are either not adjusted or a complex adjustment is required. Any such adjustment to costs is especially difficult since it involves operating efficiency and maintenance in addition to depreciation. Capital employed is overstated in relation to the costs which are reflected in the profit used to determine return on capital.

There is less divergence of practice with respect to the value of current assets included in capital employed. Some companies use gross accounts receivable. Some companies use market value or standard cost for inventories, instead of "lifo" values used in the published financial statements. In short, valuation reserves and provisions are not considered. At some time these had to be provided through charges to operations, and usually some of these charges occur each year. Why then measure operating profit, which has been reduced to the

extent that reserves were created, against asset values which do not reflect these valuation reserves? Sometimes some portion of the cash is excluded, particularly if cash is being accumulated for an expansion program. There may be some justification for this. However, if all cash is included, the adverse effect upon the return on capital provides an effective stimulus to putting the cash to work producing profits.

Finally, some companies deduct current liabilities from their assets. This destroys the effectiveness of the return ratio as a measurement of profit. As stated previously, all assets, regardless of their source, should be used with equal effectiveness and profitability.

The purpose of the return on capital ratio is for internal profit measurement and appraisal. Trends are more significant than the percentage ratios. Consistency is of prime importance and the assets included and the method of their evaluation will not destroy the effective use of the ratios so long as they are determined on the same basis year after year, and for all measurement purposes. The prime danger in departing from the published financial statements is that management time, which should be devoted to holding and improving the ratios, will be diverted to attacks upon the validity of the amount of capital used in determining the ratios.

In many businesses total assets fluctuate during the year because of seasonal influences. To the extent that interim balance sheets are available, the average assets, rather than the end-of-the-year assets, should be used as the capital employed. Below the company level this is particularly important. Managers of units of the company can be expected to play for the best score. If assets as of one date are used to develop their return ratio, they will exert every effort to have a minimum of assets in their unit at that date. This can well have an adverse effect upon company profits and company return on capital.

Use of Return on Capital for Units of a Company

The return on capital ratio is as valid a measure of profitability for units and products of a company as it is for the total company. Its use for profit measurement and appraisal below the company level requires that all costs and capital, which are not specific to the unit to be measured (division, plant or product), be allocated to it. If this is not done, the validity of the comparisons of returns of units with the company return which reflects all costs will be destroyed. For example, if all costs (e. g., general administrative expense) are not allocated, the units will show a higher return in the aggregate than that of the company. It may be argued that this presents no problem. Objective ratios for units are simply

set higher than the company objective. Experience has shown that this is less effective than full cost allocation. Regardless of the emphasis placed on objective ratios, a unit which has a return which is better than the company average, even though this is simply because all costs have not been allocated to it, is less likely to exert every possible effort to improve. You cannot change human nature—and being above average carries more psychological weight than do the reasons for being above average. Uniformity and consistency cannot be over-emphasized.

As with cost allocation, the basis for capital allocation to units must be developed to meet the circumstances peculiar to the company and to the units of the company. There is no one basis of allocation for each asset which is "right" for every circumstance. However, the more generally accepted basis of allocation are:

Accounts receivable—gross sales for the average number of days of sales reflected in receivables, with adjustments to recognize significant differences in credit terms of the individual units.

Inventories—raw material on average usage and processed items specific to product lines.

Property, plant and equipment—the allocation of depreciation for cost purposes.

Cash is frequently allocated on sales or cost of sales. However, if the actual company cash is distributed to each company unit, problems can be created. For example, with cash allocated on costs, a unit with 25 per cent of the total company cost reduces its inventory by $100,000. Since this creates cash, 25 per cent of the cash is charged back to the unit and its net reduction in capital is only $75,000. The manager is most unhappy since he was able to reduce his capital but, because no other unit needed the cash generated, he had 25 per cent of the results of his efforts canceled. To overcome this problem, some companies assign cash to units at a standard percentage of sales or cost of sales and carry a debit or credit balance of cash at the company level. The effect of this over-allocated or under-allocated cash on the company return in comparison with the aggregate return of the units charged with cash at a standard percentage of sales or cost is usually so insignificant as to be undetectable. However, if the amount of unassigned general company cash is large because cash is being accumulated for a major expansion program, there will be a noticeable difference. Under this condition the company return may be adjusted to exclude the effect of the temporary excess cash when comparisons are made of the returns of units with that of the company.

It has already been indicated that profit after income tax is used for the company-level ratio. Tax is a cost which must be recovered before there can be a return on capital. It follows, then, that income tax must also be charged against

company units before their return is determined. This is usually accomplished by applying the effective tax rate to before tax profit of each unit. Loss units are given a credit for tax savings. Minor differences which occur between these applied taxes and the actual income tax of the company are ignored.

Other Management Uses of Return on Capital

The return of capital concept has many uses beyond internal profit measurement and appraisal. It is a generally-used basis for evaluating alternatives and giving guidance to management in decision making. Exhibits 3, 4 and 5 are ex-

EVALUATING A MAKE OR BUY DECISION

	Present - BUY	Proposed - MAKE
Sales	$ 100,000	$ 100,000
Cost	92,500	89,600
Profit	$ 7,500	$ 10,400
Capital:		
Cash and Receivables	$ 15,000	$ 15,000
Inventory	10,000	$ 15,000
Fixed Assets	25,000	$ 35,000
	$ 50,000	$ 65,000
% Profit on Sales	7.5%	10.4%
Turnover	2.00	1.54
Return on Capital	15%	16%
Added Profit / Added Capital = Return on Added Capital	$ 2,900 / $ 15,000 =	19.3%

EXHIBIT 3

amples of the use of return on capital for make-or-buy decisions, inventory planning and pricing. In the area of capital expenditure evaluation, the return on capital has almost universal acceptance. Here techniques have been developed beyond the use of the average return on average added capital; e. g., present worth method and investor's method. These are simply further refinements in the use of the concept and discussion of them is beyond the scope of this presentation.

Education and Communication Essential

In putting the return on capital concept to work in a company, communication and education are vital. First, top management must understand and accept the

INVENTORY PLANNING

(5% Price Increase on a Raw Material)

	Units	Value
Normal Stock - 3 Months	200,000	$100,000
Added Stock prior to price increase	200,000	100,000

Saving 200,000 @ $.025 = $5,000

Average Added Capital $\frac{\$100,000}{4} = \$25,000$

Returned on Added Capital $\frac{\$\ 5,000}{\$25,000} = 20\%$

EXHIBIT 4

ratios as valid bases of measurement and appraisal. If they are not enthusiastic about the concept, it cannot be used effectively at the lower levels. Silent enthusiasm is not enough. Top management must communicate their enthusiasm to the entire management team, establish goals and hold each manager responsible.

The entire organization must be educated in the use of the ratios and in the factors which influence them. Frequently, the first idea which gets across is that, since return is the ratio of profit to capital, the return can be improved by

PRICING FOR RETURN ON CAPITAL

Assumptions

Activity Level - Sales Volume of 10,000 units

Total Cost - Variable and fixed $22,300

Capital:

Cash, receivables and inventory 30% of sales dollars

Fixed $6,000

Desired return on capital 20%

Formula

$$\frac{\text{Total cost} + (\%\ \text{return} \times \text{fixed capital})}{1 - (\%\ \text{return} \times \%\ \text{var. cap. to sales})} \div \text{Volume} = \text{Sales Price}$$

$$\frac{\$22,300 + (20\%\ \text{of}\ \$6,000)}{1 - (20\%\ \text{of}\ 30\%)} \div 10,000 = \$2.50$$

Proof

Sales 10,000 @ 2.50	$25,000
Costs	22,300
Profit	$ 2,700
Capital:	
Variable - 30% of sales	$ 7,500
Fixed	6,000
Total	$13,500

$\frac{\$\ 2,700}{\$13,500} = 20\%$ return on capital

EXHIBIT 5

reducing the capital. This is true if the reduction can be made without affecting costs or sales volume. But if inventories are cut to the extent that too frequent stock-outs occur, production costs are increased. The cost increase can well affect profit so adversely that the return is reduced substantially by the reduction in inventory, instead of being improved. The same thing will happen if finished stocks are held at such a low level that sales are lost because of poor service.

The return ratio is the result of the interrelationship of sales income, cost and capital. The organization must be taught to consider the effect on all three of these on any decision.

If maximum effective use is to be achieved, management at all levels must be also informed of the results achieved. The absolute minimum of information to be communicated to the management group would be—(1) the objective return for the company and the reasons for selecting the objective, (2) an annual comparison of the level and trend of the company return in comparison with the returns of competing and selected well-managed non-competing companies. The monthly reports for managers of units should show the unit's return for the month and the year to date, and the unit's level and trend should be compared with those of the company and with the objective return for the unit.

There is quite a difference of opinion between companies as to whether the managers of one unit should be informed of the level and trend of return of each of the other company units. Many companies which have been using return on capital very effectively do inform all management personnel of the returns of all company units. They report that this has had a constructive effect on morale.

Conclusion

No ratio can ever be substituted for management judgment. Neither is the return on capital ratio a faultless measure which, when used, can result only in profit improvement. It is the best common measure developed to date. It measures operating profit and operating management below the company level. At the company level it is a measure of composite management, operating and financial. If its use is preceded by proper education and if the internal reports and meetings communicate results, return on capital ratios provide valuable guidance to all levels of management.

PROFIT SHARING FOR MORE PROFITS by Jean C. Sterling*

PAY PLANS THAT WORKED WELL during the "soft-sell" may not do the job during the coming "hard-sell" next year. Competition for the buyer's dollars calls for a higher degree of teamwork at all levels. It calls for better employee-employer relations. It calls for a more competitive unit cost. In short, it calls for a whole new approach to management policy, and, since the root of any cost reduction program is the company's compensation philosophy, that would seem to be the place to check first. Is the philosophy of "a fair day's pay for a fair day's work" good enough? Does it go far enough? What probably is needed is an all-out profit sharing program that will blanket the entire organization.

"But," you say, "I know all about profit sharing and I think it is fine for companies making so much money they don't know what to do with it. Our business is different. We don't have much in the way of profits to pass around." Or you may take another angle. You may figure that profit-sharing is for the long-established business and not suited to a growing business plowing back profits into new plant and equipment. These are plausible comments but, perhaps we should pause before going off on any tangents about profit sharing or taking the position that, because we are passing out year-end bonuses to executives, we are sharing profits in such a way as to get real results. The experience of my company, C. H. Dexter & Sons, Inc., is applicable here. We manufacture specialty papers and are a family enterprise started many years ago in Windsor Locks, Connecticut, a town of 6,000 inhabitants, some 250 of whom work for Dexter.

Until World War II, the plant had only the usual employment problems. There was no union involved. With the advent of the war, we found that we were losing our employees to war industries in nearby Hartford. We were paying wages equal to or higher than those of other paper mills, but we could not compete with cost-plus aircraft plants. All we could hire were the less willing and less efficient. After the war, a large aircraft plant came to town with its need for 5,000 workers, its high wages, fringe benefits, retirement plan, and other inducements. Employee morale was low. We might as well have closed up our employment office. On the slightest provocation, a key employee might leave us, often in a "fine fix." Costs were high, including a 400 per cent material cost increase which we could not pass on to the customers. We knew how to cut costs, but we didn't dare try.

Our executive bonus plan for key

* Secretary-Treasurer, C. H. Dexter & Sons, Inc., Windsor Locks, Connecticut.

personnel, including foremen, did not help. This plan was established in 1940 in the belief that executives and foremen were the key to production, greater output, and therefore, larger profits. Some of our management group realized that, if we were ever going to decrease costs, cut down waste, and attract better workers, we would have to take the man-on-the-machines into the act. After all, we needed the workers as much as they needed us—maybe more.

We got our initial information on profit sharing at an N. A. A. meeting. We thought it offered the solution of many of our problems. The officers and the stockholders agreed that, if this was the right thing to do, we wanted to do it. But what if there were no profits to share as sometimes happens in nearly every business? And what should the workers' share be? It took our group two years to study and work out all the details of what looked like a workable plan for us. The plan we adopted and launched in 1952 is a combined cash-and-deferred payment arrangement which provides incentives both to greater productivity and to life-long employment.

With this plan in effect, our management brought out its work-simplification ideas, its new methods, its plans for new equipment, and its waste-reduction program. We started by inching up the speed on a new grade of paper we knew could be produced faster and which was a competitive item. Here is the amazing result. The gang on the adjacent machine watched the quickened pace of No. 3 machine, then insisted that theirs be given the same treatment. The company's first little move started a race that ended with all paper machines running an average of 23 per cent faster—by request of the men on the machines. The pace is hurting no one. Everybody is happy and making good money.

At the end of our second year of profit sharing, the employees' average cash share was equal to 50 cents an hour in extra pay or four extra weeks' wage every quarter, and the contribution to the deferred trust averaged $1,000 an employee. In 1956, we distributed $400,117 in cash and the maximum permissable amount (15 per cent of payroll) to the deferred trust fund. As for the stockholders, sales increased 60 per cent without any plant expansion or new equipment, then went to twice the 1951 figure when new machines were added. Cost of sales in 1956 was the lowest in the firm's history. Since profit sharing was started, there has not been a time clock in the mill. Only one person left the company in 1956. Employee morale is high, especially around the time the quarterly cash bonus is due.

What actually happened in our plant was the birth and rapid development of a new worker attitude—the pride of belonging, of being "on the team." The men were willing to work, not merely hard, but also in-

telligently and co-operatively, because they got their share of the profits these extra efforts produced.

A summary of specific benefits would include these:

1. Machine down-time reduced more than 3 per cent—a great saving in a paper mill.
2. Salvage and re-use of valves, piping, and other supplies and materials previously scrapped. Lights turned off, water taps shut off, "broke" (waste pulp and damaged paper) kept clean and properly separated.
3. Much less "vanishing" of small tools, and longer tool life.
4. Cartons from incoming materials, formerly thrown away, now used as filler pads—saving about $1,000 a year.
5. All paper machines now running 23 per cent faster than before profit sharing.
6. Dipping machines operating 39 per cent faster.
7. Finishing department trimming (waste) reduced from 3 to 5 per cent by operation changes which, before profit sharing, "could not be done."
8. Saving of 10,000 to 12,000 pounds of steam an hour in the processing department. It now notifies boiler room of coming shutdown in time to reduce pressure so that less steam is "blown off."
9. Co-operation in Monday morning motor start-ups keeps peak load down.
10. Employee suggestions and inventions have overcome many operating problems, particularly in the area of waste reduction. One employee-designed gadget reduced from seven to two the number of men needed to change over a paper machine wire. Another employee came through with an idea for collecting fuzz on the drier rolls and thereby eliminated a shutdown every three or four hours.
11. Some obsolete woolen drier felts, slightly off size, had been charged off as a loss because the company could not use them. When the profit-sharing spirit had caught on, someone found a way to use these felts, saving $7,000.
12. Three new employees were being considered to keep the plant clean and up to date. When the men in the plant heard about this, through their foremen, they decided to keep the areas clean themselves, a $10,000 payroll saving.
13. Employees need very little supervising and almost no policing. Profit sharing makes every man his own—and sometimes his co-worker's—supervisor. One man left because he couldn't hold up his end. The chiding he got from other workers was too much for him.
14. We now have a long waiting list of desirable young people wanting to work here.

Some Variations In Construction and Use of Return on Investment

(Based on N.A.A. Technical Service Accounting Procedure Survey No. 1648)

A REVIEW OF THE LITERATURE so far published illustrating current procedure in using return on investment indicates that the limited number of companies presently working with this measurement device have many similar objectives in mind. The procedures they use in attaining the broad objectives, however, vary considerably between companies. To bring to light some of these broad objectives and the variations used in attaining them, inquiry was made of a number of members through Accounting Procedure Survey No. 1648. Replies to three or four of the questions asked in it appear to be of particular interest to companies contemplating the use of or currently working with the return on investment concept. Before going into some of the detail areas covered by the questionnaire, it may be interesting to review, for this and other purposes, some of the current practices in the construction of fixed asset and working capital investment figures.

Investment in Plant and Equipment

Basic to the use of the return on investment concept is the question of how to value the asset investment. Most companies seem to use historical cost for purposes of operating cost comparisons, with the use, in some cases, of replacement cost for such purposes as cash forecasting, insurance valuation and determination of capital expenditure preferences. In the use of historical cost, there seems to be some division of opinion as to whether assets should be stated on a gross basis or net of depreciation. Russell B. Read, in the June 1954 *N. A. A. Bulletin*,* stated that "Evidence seems to be that most companies measuring return on assets include fixed assets at gross value, that is original book value."

Among the reasons given by several companies for the use of the gross figure are the following:

1. It provides some equalization of facility values of the different divisions or companies, especially between those with old plants built at relatively low cost and those with new plants built at high cost.

* Return on Investment—A Guide to Management Decisions—Russell B. Read, *N.A.A. Bulletin*, June 1954—Section 1.

2. Assets of manufacturing companies, unlike mining companies, are considered to be on a continuing basis rather than depleted and abandoned.

3. Gross assets of one plant can be compared with those of another plant where depreciation practices may be different.

4. Reserve for depreciation is not deducted from the gross asset value of property, since it represents the retention in business of the funds required to keep intact the original investment by stockholders. Actually the fixed assets are used to produce net income during their entire life and, therefore, full cost value is considered a sort of investment until the assets are retired from use.

5. A deduction for liabilities and reserves from the amount invested in operating properties would show a fluctuation in operating investment due to growth of reserves and change in amount of stockholder capital which, in turn, would produce such a distortion in the return on investment as to render it meaningless.

Among the reasons given for use of assets net of depreciation are the following:

1. While invested capital is conventionally understated at the present time, the wrong method of increasing it cannot be relied on to furnish the right results and the attempt can only add to the existing confusion in accounting thinking. Cash built up via a depreciation reserve, if added to the gross assets, amounts to overstating the investment.

2. Fixed assets are shown at net depreciated values thus avoiding duplication of asset values.

3. An investment is something separate and distinct from the media through which it was made. The purchase price of a machine should be regarded as the prepaid cost for the number of years of production expected. Its value, and hence the limit to its investment status at any time thereafter, will depend not on its current mechanical efficiency but on the number of years of future production it can promise. Each year this number will decline and the decline should be offset by cash withheld from gross revenues.

   The function of depreciation accounting is to maintain the aggregate invested capital by providing substitute assets currently (originally cash from revenues) to replace the aggregate asset consumption (depreciation) of the year.

The differences in viewpoint above are broad and basic and decisions based on return on investment analyses should be made with an understanding of what is implied in the selection of the base used.

Calculation of Working Capital Investment

Problems of valuation are also present in the working capital area relating to inventories. In addition, there are questions respecting employed and unemployed funds, seasonal funds and funds collected for others, such as pension and tax reserves.

On the question of inventory valuation for investment purposes, published literature seems to indicate that variations in valuation methods are about as numerous as variations in methods used for valuing inventories for statement purposes. In a number of cases, this is due to the fact that book figures, themselves, are used as the investment figure. In the survey, the following specific question regarding "lifo" valuation was asked and ten replies were received.

Do you make any adjustment of your return on investment in inventories calculation where the "lifo" method of inventory valuation is used?

1. At the company level, no; assets are used as stated on the balance sheet, i. e., net of inventory valuation reserves. For divisions, yes; specific by divisions at standard costs, less reserves for lower of cost or market valuation. "Lifo" valuation reserves are not deducted.
2. No.
3. Inventories not valued on "lifo" basis.
4. No.
5. Yes.
6. In developing and trying to promote the use of return on investment studies, we have limited our computations mainly to book figures, so that they will be recognizable and we can avoid other issues at first. Once a consistent application of the return on investment concept is accepted, we would expect to develop figures based on current values. We have done occasional work on this basis for special situations, as in union negotiations.
7. No adjustment is made in whatever inventory valuations are based on "lifo".
8. We do not use "lifo".
9. No.
10. A "lifo" reserve is used but not applied to reduce total investment.

Turning to the question of what types of special purpose cash or funds to exclude from working capital, Accounting Procedure Survey No. 1648 asked for company treatment of several of these items, such as capital required temporarily to meet seasonal peaks, permanent capital awaiting investment, funds collected

for others such as pension and welfare funds, reserves for taxes, etc. Replies indicated that, where such items were excluded from working capital, some method of averaging was often used. Among the methods described were the following:

1. Cash is considered as a predetermined percentage of cost (sales minus profit after income tax at 52 per cent.)
2. Investment base for annual calculation of return is average of 12 months' assets.
3. Working capital includes only inventories and receivables—we assume that cash on hand offsets payables.
4. Our cash allocation formula is: 15-days value cost of goods sold plus 15 days selling, administrative, research and engineering expenses minus 15 days depreciation expenses.
5. We use a standard amount of cash related to the total cost of sales which has been established on the basis of experience.
6. We exclude from our allocations to *operating units* excess cash, determined by cash needed to cover expenditures for a period determined by discount dates, and investments in non-consolidated subsidiaries. In the final overall company computations, we feel that, of course, all funds invested must be included. To the extent that we average beginning and closing assets by quarters, we only partially exclude seasonal factors. A monthly average would catch additional seasonal factors.
7. The following assets are excluded from all calculations: cash, securities, prepaid charges, investment in and advances to foreign subsidiary companies, and sundry investments and deposits.
8. This company does not exclude any items of this type because of their minor nature.
9. Cash is determined as equal to one half annual operating expenses.

In addition to the above it might be of interest to note that a fine distinction was drawn in the case of one company which stated that funds deducted from wages for the purchase of bonds are not excluded from working capital because the company has the use of the cash until the bonds are purchased.

Allocation of Investment to Products

George W. Frank*, discussing the problems of allocation, states that, "the ultimate objective of the investment distribution analysis is the computation of

* Let's Develop Return-on-Investment Consciousness, George W. Frank, *N.A.A. Bulletin*, October 1956, Section 1.

a monthly return on investment for each product sold * * * the distribution of cost associated with any investment journalization must be handled first and this often indicates the distribution of the investment, eliminating many separate decisions. * * * The distribution basis used for these costs will apply to the investment distribution made later. This type of situation holds true for most investment distributions, which considerably reduces the task of determining how much of each investment belongs to what product. * * * It is possible to use predetermined distribution percentages, reviewing them periodically, perhaps annually." There is, of course, an alternative to the use of a production base and it is given by the same author as: "allocation on the basis of the purpose of the assets' original construction or purchase, which was probably to produce so many units or pounds of each product. A solution in such instances is to establish predetermined percentages annually, based on past performances modified for changes expected, and to use these percentages until there is some basic change, such as the production of a new product from existing equipment."

Largely supporting the above concepts are replies to Accounting Procedure Survey No. 1648 indicating that some measure of product usage of facilities is being relied on in a number of cases. Numerous variations in procedure, however, are present and individual replies to the following question may be of interest.

Where facilities are jointly used in producing a product, on what basis do you allocate them to products in developing return on product investment?

1. Ratio of time demand of products at normal sales volumes.
2. Estimated usage for each line. Return calculations by product line within an operating division are made only periodically based on analysis.
3. Investment allocated generally on the basis of cost allocation. Basis varies with kind of cost and originating center.
4. Joint facilities are ordinarily allocated to products in ratio of each product's use of the facility.
5. Investment is allocated on the basis of the amount of time used by each product. Tabulating card records are used.
6. We allocate our casting shop investments on the basis of finished production pounds to and by the rod, sheet and tube mills which they supply. Service department investments are allocated on the basis of the value of equipment in the respective operating departments which they maintain and serve. Land and buildings jointly used are allocated on the basis of area usage. Investment in ma-

chinery jointly used is allocated on the basis of direct labor hours charged to the operating departments involved.

7. The allocation basis depends on individual circumstances. Generally speaking, we endeavor to use the same basis for allocation of assets as we do for allocation of depreciation and costs. In a few instances we make an exception to this general rule, where expediency requires a more approximate method.
8. We do not compute return on investment at product level.
9. Usage based on engineering studies.
10. Percentage of use in factory sales dollar basis for warehouse and commercial expenses.

Conclusion

The subject of return on investment is a prominent one today. Two references may be appropriately given here as starting points. One is "Return on Investment—Gist of a Technical Service Survey" by Donald G. Mackenzie (*NAA Bulletin*, February 1954) and the other is the same author's "Looking Around: Cost Accounting Literature" (*Harvard Business Review*, Jan.-Feb. 1957).

Dealt with above are just a few of the procedures followed in the determination of the investment base and the allocation of it to products or product lines. They do not attempt to deal with the composition of the income figures making up the return side of the picture. Needless to say, the method of handling reserves for depreciation, special purpose cash funds and other items in the investment base is related to the treatment accorded them in the income picture.

Costing Practices of 37 Cotton Textile Firms

by SYLVAN H. SACK

THE COTTON TEXTILE INDUSTRY, the largest segment of the textile industry, embraces a large number of manufacturing units or mills, as they are commonly called. Of these, about 80 per cent manufacture yarn and/or gray goods (unfinished) and process fiber on the cotton system using basically either cotton or cotton and synthetics, while the other 20 per cent dye and finish. The mills are operated by a much smaller number of firms, generally in a parent-subsidiary relationship, with the exception of smaller one-mill organizations. It is the purpose of this study to stimulate thought and interest on the part of cost and managerial people in this industry field by:

1. Reporting the current use of certain cost accounting practices in selected firms.
2. Discussing the usefulness of practices in accordance with cost accounting concepts, with special reference to the industry.
3. Making recommendations based on the data.
4. Providing additional background for future research.

Methods of Investigation

The questionnaire technique was employed in gathering data. Thirty-seven firms are included in the survey. These have centralized functional control over cost accounting procedures in 126 cotton textile mills. Information on firms, on geographical location of mills, on size, and on number of firms, mills, and spindles, and other statistics was obtained from several industrial and governmental compilations. The 37 questionnaires went to (and were answered by or on behalf of) 13 controllers or assistant controllers, 16 treasurers, assistant treasurers, or secretary-treasurers, and 8 other respondents in such position groups as chief accountants, a vice president, etc.

Exhibit 1 compares the geographical distribution of mills in the survey with mills in the industry, revealing a generally similar pattern. It should be noted

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GEOGRAPHICAL LOCATION OF MILLS REPRESENTED BY SURVEY

Area	No. mills sample	No. mills population	% in sample	% in population
South Atlantic	79	617	63	59
Mid Atlantic	10	138	8	13
East South Central	20	99	16	10
New England	13	131	10	12
Other areas	4	66	3	6
Total	126	1051	100	100

EXHIBIT 1

that the sample runs over and under 10 per cent of the population. Another measure of size is number of spindles. There are approximately 23,000,000 cotton-system ring spindles in place in the whole of the industry. About 5,400,000 or approximately 24 per cent of these are operated by mills represented in this study. Of course, there is always the possibility that an element of non-response bias, inherent in the questionnaire method, may exist. Statistical significance tests do not lend themselves to this type of research, as the data was determined by a type of quota sampling technique.

A separation between multi-mill organizations and smaller—essentially one, two, and three mill firms—is made in the presentation of the survey results. One reason for this, as expressed by one cost accountant in the industry, is the increased complexity in operation brought about in the control of a number of mills. A breakdown into two size groups, generally conforming to the structure of the industry, was determined to be the most significant. A firm is placed in Group 1 if its organization consists of five or more mills; all other firms are classified into the smaller size class, Group 2. In one case a special situation arose. A firm operates over 400,000 ring spindles and has a completely integrated manufacturing operation at one centralized location. This firm is classified in Group 1. It is recognized as being a large organization. There are 17 firms in Group 1 and 20 in Group 2.

The cost accounting practices reported by the 37 respondents are classified into four cost areas: (1) inventory methods, (2) factory costs, (3) distribution and administrative expenses, and (4) managerial tools of cost accounting, and are covered in this paper in that order. In each of these areas, there were responses to practices which, taken together, tended to show the extent to which identifiable cost accounting practices are currently being used. Efforts have been made to set forth the findings of the study in tabular form as objectively as possible. A tabulation may relate to a single question which required a yes or no answer or to a series of questions, especially where alternative practices are in

use. Where the totals appearing in a tabulation are less than 37 (or 17 or 20 in the case of groups), the remaining firms did not answer the question. Where percentages are used in referring to tables, they are based on firms answering.

USE OF PERIODIC AND PERPETUAL INVENTORY METHODS

PRACTICE	Size groups 1	2	TOTAL
Periodic inventory method	2	5	7
Perpetual inventory method (controlling accounts valued at actual)	4	2	6
Perpetual inventory method (standard costs tied-in with accounts; variance accounts on books)			
Debit in process accounts at standard; credit with actual units at standard	7	6	13
Debit in process accounts at actual; credit with actual units at standard	2	2	4
TOTALS	15	15	30

EXHIBIT 2

FIXED AND FLEXIBLE BUDGETING

PRACTICE	Size group 1	2	Total
Variances (volume distinguished from other causes) determined on some flexible budget basis	10	5	15
Variances analyzed on some fixed budget basis	3	3	6
Some budgeting system but no variance analysis	2	7	9
No budgetary control	1	4	5
Totals	16	19	35

EXHIBIT 3

Inventory Methods Used

Two types of inventory methods were revealed. One is commonly known as the periodic inventory and the other the perpetual inventory. In the latter, the factory cost accounts (labor, material, and overhead in process accounts), finished goods, and cost of goods sold accounts, are on the books and, as controlling accounts, are related to perpetual inventory records. In the periodic inventory method, this relationship does not exist. The inventory quantities are obtained periodically by physical count, valued, and placed on the books. The perpetual inventory method, which is recognized as a valuable cost accounting practice, offers the integration of cost and general accounts in the recording and control of the flow of work through the mill. It further enables the firm, if it so chooses, to tie-in standard costs in with the books and to include variance accounts as part of a standard cost accounting system. It should be noted that, in the periodic inventory method, supplementary records showing perpetual inventory quantities on hand may be used and that, with the perpetual inventory system, physical inventories are taken at periodic intervals. Exhibit 2 shows the currently-used inventory methods of the 30 firms (out of 37) which provided this information.

A little under one-quarter of the firms use the periodic inventory method. The larger portion of the firms in the sample use the perpetual inventory method, with a tie-in of standard cost with the books being favored, especially the method which charges in-process accounts at standard. The perpetual inventory method appears to be used by the larger firms (Group 1) to a greater extent than by the smaller firms (Group 2).

Procedures are available which serve to supplement whatever inventory method is in use, as for example bin cards or tags showing the balances of goods in stock. These serve as an added form of direct control over finished goods inventories.

Practices Followed in Accounting for Factory Costs

Flexible budgets consist of budget data prepared beforehand for predetermined levels of activity. This type of budget is thus capable of being adjusted to the actual level attained and compared to actual costs for variance analysis purposes (difference between actual and standard or predetermined costs.) Semi-fixed expenses or semi-variable expenses are separated into their fixed and variable elements in the preparation of flexible budgets, enabling accurate results in variance determinations of the components of material, labor, and overhead expenses.

There is no predetermination of budgets and adjustment of same with actual volume where variances are determined on some fixed budget basis. Although there may be analysis of variances here, the results are not as accurate from a cost control viewpoint, because semi fixed expenses are not distinguishable from fixed and variable expenses in the budgeting process. Of the three general uses of budgetary control-planning, coordination, and control—the fixed budget is weakest in the latter. Where there is variance analysis, the fixed budget is a path toward cost control although it does not have the advantages of flexible budgeting.

Exhibit 3 shows current use of budgetary cost control in the companies surveyed. The data shows that a large percentage of firms use budgeting in some degree. The majority of firms, approximately three-fifths, determine variances for cost control purposes by means of budgeting, with the flexible budget being favored, especially by the larger firms. The remaining firms, which include over half of the smaller firms, either have no cost control by budgeting or no budgetary control at all. There is some similarity in practices among the larger firms.

There are two basic procedures which are used by firms in comparison of actual costs with budgeted amounts, as shown in Exhibit 4. In one practice, sometimes referred to as the average budget, the budgeted amount for the period, one or more years, is divided by a constant, such as the number of weeks, months, or quarters in a year, to arrive at an average weekly, monthly, or quarterly budget which is compared to actual results. The other method bases the budget

on the estimated activity level of the coming period. Flexible budget methods may be used in conjunction with either of these two procedures, whereas, under the fixed budget system (where no predetermined levels of activity are prepared), the average budget must be used. The planning aspect of budgeting is comparatively limited under the average budget, but this method is a more simple one to operate. Of the 30 firms shown in Exhibit 3 that employ budgeting, the majority, as shown in Exhibit 4, use the average budget method.

Exhibit 5 reveals intervals used by responding companies in the comparison of actual results with standard budgets. It is evident that the majority of firms in each size group use monthly intervals, with the smaller firms making the comparisons more frequently.

USE OF AVERAGE BUDGET

PRACTICE	Size Group 1	2	Total
Actual costs compared with average budget during intervals within year	13	11	24
Actual costs compared with budgets prepared at anticipated levels of activity during intervals within year	2	4	6
Totals	15	15	30

EXHIBIT 4

INTERVALS AT WHICH ACTUAL RESULTS AND BUDGETS ARE COMPARED

INTERVALS	Size Group 1	2	Total
Weekly	2	4	6
Monthly	9	10	19
Quarterly	3	1	4
Totals	14	15	29

NOTE: With one exception, the firms that did not answer are those with no budgetary control.

EXHIBIT 5

The final group of practices in this area, covered by the survey, relate to cost control and the extent to which firms analyze variances for raw materials and direct labor (the components of prime cost). The raw material variance determined by comparison of actual and predetermined values is separated into price and quantity parts by 18 of the 37 firms in the survey, slightly less than half of the total. The direct labor variance is separated into these parts by 15 of the 37 firms or approximately 40 per cent. Less than fifty per cent of combined firms use these practices. There is similarity in use of these practices by the two groups. The separation of the variances into price and quantity parts may be made on the books or it may be off the books as part of budget reports and schedules.

Normal Rates and Capacity Bases; Product Costs

The nature of the burden rate used is an important factor in the determination of product costs as well as in the composition of the cost accounting system generally. The rates may be placed in three classes: (1) burden reapportioned during the year because of changing production, (2) same rate used throughout one year (short run concept of normal), or (3) rate used throughout several years (long run concept of normal). The use of these practices is reported in

Exhibit 6. A normal rate thus applies when the capacity level upon which the budget is based remains the same for one or more years. When management decides to change the standard or budgeted capacity level (which, incidentally, may or may not correspond to actual level of production), the burden rates at the various cost centers must be recomputed, as the burden allocated to each of the centers is spread among a changing number of units, such as labor units or machine time units, e. g. spindle hours, loom hours, etc. The component standard cost of units at each center then changes with the resulting revision of standard product costs.

NATURE OF BURDEN RATES USED

Practice	Size Group 1	Size Group 2	Total
Burden is reapportioned during the year because of changing production	2	8	10
Normal rate is used throughout one year	5	6	11
Normal rate is used throughout several years	9	6	15
Total	16	20	36

EXHIBIT 6

USE OF CAPACITY BASES

Capacity Bases	Firms
Sales expectations	7
Plant capacity and sales expectations	9
Practical or some maximum use of equipment	10
No budget	9
Total	37

EXHIBIT 7

In the first class, where burden is reapportioned to give recognition to fluctuating levels of production, the standard product costs tend to absorb burden expenses in degrees varying with the frequency of reapportionments. The product costs then tend to correspond to the "actual" cost of producing a product. This method has a weakness for, in a period of high demand and production, the unit costs shown by the system will be low because of the spread of fixed expenses over a greater number of units. Conversly, in periods of low production and demand, product costs are high and it appears that the resulting product costs here would be insignificantly different from the market prices and would present management with data with limited usefulness as well as a misleading picture of profit and loss by products classes. The problem created by fixed manufacturing costs, including high depreciation for equipment, poses a need for the equitable spread of costs. A normal rate minimizes sensitive unit cost fluctuations and, in an averaging out process, presents a stable pricing policy, in addition to eliminating some reoccurring detail work. The long-run type of rate used over a several year period appears to best satisfy these needs.

Normal rates are used by approximately 70 per cent of the firms, with the normal rate which is used throughout several years being favored. The remaining 30 per cent, mostly small firms, do not use normal rate. It was noted that the firms which reapportion burden during the year are mostly from among those that have no budgetary control, as well as several firms which use a skeleton budgeting system that is not a framework for the pricing structure.

Under normal concept, rates are recomputed only when management alters

the budget capacity level and not when production changes. In the short-run concept of normal, capacity may be based on the estimated sales volume for the coming period or on some maximum-use-of-equipment basis for a similar span of time. Under the long-run concept of normal, where capacity upon which budget is based remains the same for more than one year, usually several years, there are two general approaches which may be used in determining capacities. The first is that level of production hours (such as card, spindle, loom hours), which will give ample goods to meet the average expected sales volume or demand during a future number of years, such as business cycle of three to five years. Here the relationship of capacity and sales expectations exist. The other method is based on "practical plant capacity." This may be one shift (40 hours per week), two shifts (80 hours), or three shifts (120 hours), modified by unavoidable breakdowns and repairs. The three-shift cost accounting basis gives low unit cost results and is more rigid than others; it is referred to as theoretical maximum. Exhibit 7 shows the use of various capacity bases for budget purposes.

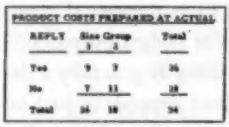
Preparation of product cost sheets in textile manufacturing is generally a detailed and cumbersome task. The amount of work involved depends in part on the number and styles of yarn and fabric constructions, as well as the number of cost centers. One integrated fiber-to-fabric mill uses something like fourteen cost centers, e.g., opening, carding, drawing, spinning, weaving, etc. The material developed by the survey in this area relates to the comparative use of actual and standard product costs. The discussion in the previous section on normal rates points up the fact that reapportionment of burden, depending on its frequency, as contrasted to normal rates, generally tends to give low product cost value in periods of high demand and high value in periods of low demand. This situation applies to actual product cost values and, in cases, to standard product costs which are continuously subject to absorption of burden. The basing of standard cost structure on normal capacity averages out fluctuations and gives management more useful information for decision making purposes and pricing policies.

One well known firm in the industry, in order to know the relationship of product costs and profit data for short-run changes in production, adjusts the standard cost values, which are based on a normal rate used over several years, to actual by means of variance data obtained from the budget report. This procedure gives recognition to a concept which is important in cost accounting, i.e., the relationship of value of cost data to the accounting expense involved in giving the information.

In the selection of procedures one consideration might be held in mind. Can the facilities of the cost accounting staff be applied in about the same time

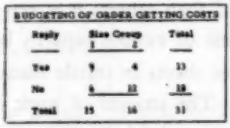
and with same expense to a different cost activity or practice which is capable of supplying management with more useful information than the one presently in use? It should be remembered that a system supply has a great amount of detail, yet fails to give management the data it needs to more profitably run the business.

In regard to the current use of product costs, the survey reveals that all 37 firms prepare product costs at standard value. Exhibit 8 shows that 16 firms prepare product costs at actual value (these same firms prepare standard product costs as well). The majority of larger firms prepare product costs at actual; the majority of smaller firms do not. Of the 16 firms in total that have actual product costs, 8 prepare them at monthly intervals, 2 at quarterly intervals, 1 yearly, and 5 at other time intervals.



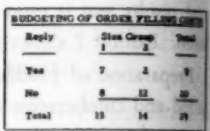
PRODUCT COSTS PREPARED AT ACTUAL			
REPLY	Size Group 1	2	Total
Yes	9	7	16
No	7	11	18
Total	16	18	34

EXHIBIT 8



BUDGETING OF ORDER GETTING COSTS			
Reply	Size Group 1	2	Total
Yes	9	4	13
No	6	12	18
Total	15	16	31

EXHIBIT 9



BUDGETING OF ORDER FILLING COSTS			
Reply	Size Group 1	2	Total
Yes	7	2	9
No	8	12	20
Total	15	14	29

EXHIBIT 10

Accounting for Distribution and Administrative Expenses

Distribution and administration expenses, although they comprise a relatively small part of total expenses, should nevertheless be properly controlled and accounted for. In the current market, distribution activities are receiving increased importance. By means of expanded sales promotion activities, such as advertising, brand names, and attractive packaging, firms are finding that they can stimulate consumer interest and receive higher prices for their goods. In these firms cost accounting for these expenses become increasingly meaningful. The following practices are reported in these areas: (1) allocation of marketing and administrative expenses to product costs, (2) budgeting of order filling and order getting expenses, (3) analysis of distribution expenses by departments and (4) the analysis of distribution expenses by functions. There are, of course, other practices reported in this area, but these were selected as typical and important in themselves.

The survey shows that distribution and administration are allocated to product costs by about 60 per cent of the firms. This practice is carried on more by the large firms than by the smaller ones. Budgeting of distribution, or marketing expenses as they are referred to in the industry, assists in the control and planning of these items. Marketing expenses are classified into two groups, order

getting and order filling. Order getting costs are those acquired in obtaining orders for sales; order filling costs are acquired in the processing and shipping of these orders. Practice with regard to these is illustrated in Exhibits 9 and 10.

The majority of firms do not budget order filling or getting costs. This is especially true in the smaller firms. In reviewing this data it should be held in mind that many more smaller firms than larger ones sell or do their distribution through selling agents.

Procedure relating to two aspects of administration expense analysis is reported in Exhibits 11 and 12. The former, in showing the extent to which a departmental breakdown of general administrative expenses is made, reveals that the largest segment of the firms do not make this analysis. Exhibit 12 concerns a specific administrative division, the accounting department. It reports the extent to which accounting department expenses are analyzed on a functional basis. A knowledge of the costs of the various functions of accounting, which includes such items as payroll, budget, and statement preparation, will aid in the evaluation of the efficiency of the accounting system. If the cost of a function is determined, there are factual grounds available for deciding whether it is yielding adequate information in the light of its cost. It is a starting point for obtaining data for alternative procedures. As a practical matter, as indicated in Exhibit 12, firms are hesitant to spend money for this intangible factor.

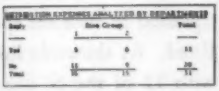


EXHIBIT 11

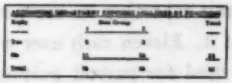


EXHIBIT 12

BREAKEVEN CHART ANALYSIS USED

Reply	Size Group 1	Size Group 2	Total
Yes	5	2	7
No	10	14	24
Total	15	16	31

EXHIBIT 13

Use of Managerial Tools of Cost Accounting

"Managerial tools of cost accounting" is a term used in this paper to refer to certain cost accounting tools or procedures which are valuable aids in assisting management in decision-making. They include the breakeven analysis, marginal income approach, and the gross profit analysis. These topics were covered in the survey.

The breakeven chart is a portrayal in graphic form of the relationship of profit and volume, and costs. The data on costs at various operating levels, as presented by flexible budgeting, may be used in the construction of this table. As illustrated in Exhibit 13, the firms represented generally do not use the breakeven chart. It is used by about one-third of the large firms and only one-eighth of the small firms.

The use of the marginal income approach is shown in Exhibit 14. Sales minus variable costs give marginal income. Variable costs here refer to "out of pocket costs," as this approach may be called. The tool can provide the firm that rigidly adheres to a concept of total product costs for decision-making purposes, with a basis for modifications and help it adopt a broad policy viewpoint toward sales and profit positions. The results here are identical to those in Exhibit 13 on the breakeven chart. The firms do not generally employ these practices.

Gross profit is the difference between sales and cost of goods sold. By gross profit analysis, the contributions of products, sales territories, customer classes, and other groups may be determined with a view toward controlling the causes of gross profit variation. Exhibit 15 illustrates that the majority of firms, a little under 70 per cent, employ this multi-use tool.

MARGINAL INCOME ANALYSIS USED

Reply	Size Group 1	Size Group 2	Total
Yes	5	2	7
No	10	14	24
Total	15	16	31

EXHIBIT 14

SALES EXAMINED BY GROSS PROFIT ANALYSIS

Reply	Size Group 1	Size Group 2	Total
Yes	10	12	22
No	5	4	9
Total	15	16	31

EXHIBIT 15

The final practices covered by the survey concern the use of tabulating equipment in cotton textile firms. The nature and variety of uses of this machinery is well known. It is used by the majority of firms in the survey, less than 70 per cent of firms in Group 1 and a little under 50 per cent of the firms in Group 2. The 20 respondents reporting its use were requested to state the applications to which they put it. Eleven such uses were listed. As shown in Exhibit 16, it is most widely used for payroll purposes, with 12 of the 20 firms (60 per cent) using it for this specific function. It is used by a number of firms for various cost accounting and production purposes.

Purposes Served

A few observations can be made on the basis of the data, here tabulated, on current use of cost accounting practices in use in the 37 cotton textile firms surveyed. The firms do not, generally, use available costing methods, to any significant degree, in the areas of distribution and administrative expenses and of managerial tools. It is quite possible that firms not currently employing such procedures should investigate the nature of practices in these areas and their usefulness to management, especially such tools as breakeven chart and marginal income approach. A lesser number of firms lack the use of cost accounting in the area of factory costs. Nevertheless, more consideration could be given to budgeting by some firms.

USES TO WHICH TABULATING EQUIPMENT IS PUT

USE	NO. FIRMS	PER CENT
1. Payroll	12	60
2. Inventory control	10	50
3. General accounting functions (accounts receivable, payable, etc.)	7	35
4. Various cost purposes (not specified)	7	35
5. Sales Analyses	7	35
6. Production planning and control	6	30
7. Billing	5	25
8. Order filling	2	10
9. Shipping	1	5
10. Maintenance control	1	5
11. Quality control	1	5

EXHIBIT 16

It is observed that the large firms generally employ cost accounting practices to a greater extent than do the smaller firms. This is evident in varying degrees in each of the four cost areas considered. Also noted is some lack of uniformity in use of practices within the different size groups as well as between them. The question arises as to why this is the case. The answer is not a simple one but it appears that the condition arises at least in part because of the complex organization of multi-mill firms. It might be said that these firms have a more apparent and immediate need for control and efficiency in operation than do the smaller size firms. Also, because of their size, they are in the financial position to obtain the services of specialized consultants and/or expend salaries in compensating qualified cost and managerial personnel who are equipped to evaluate the needs of management and install procedures, systems, and initiate policies that will satisfy these needs. One large firm has a cost accounting division at its administrative office. It is a function of this group to install systems for affiliated mills, send advisory personnel when necessary, and generally maintain centralized functional control over cost procedures within its organization. The comparatively smaller firms may be unable (or unwilling) to expend monies for such systems or advice, even though their needs for pricing, cost control, and other uses of cost accounting are apparent.

The degree of effectiveness of a cost accounting system is not necessarily measured by the large amount of detail or the expense incurred in establishing procedures, but rather by the usefulness of the information the procedures supply to management. It must also be borne in mind that the benefits of a cost accounting system that uses sound concepts in formulation may not become immediately apparent, but within a reasonable period of time they will be noticed.

In the initiation of cost accounting practices or a series of practices, certain steps are suggested. The firm must recognize the needs of management, determine what information the cost accounting system should provide to satisfy these needs, select those cost accounting practices, including frequency of application, which will supply this information and know how to install these practices or be willing to acquire qualified people to do this. Each of these steps may present challenges in terms of recognition and application, which the firm should be willing to meet.

SELECTIVE SYSTEMS DESIGN by John A. Foley*

INCREASED EMPHASIS ON USE of accounting machines and electronic equipment in recent years has swept many accounting departments into a regimen of procedure standardization, which has often resulted in the accountant working for the system, rather than vice versa. In our frenzy to "put it on tab," we have often overlooked less spectacular but more suitable systems geared to accomplishment of accounting's primary ends—(1) control and (2) fast, meaningful figures for management. In order to illustrate this thesis, let us consider the order-invoicing procedures now used at Scott-Atwater Manufacturing Co., a major producer in the rapidly growing outboard motor industry.

The manufacture and merchandising of outboard motors has much in common with the automotive and appliance industries. The basic product offered is a "big-ticket" item, but successful long-range merchandising also requires production and sale of a large quantity of relatively low-value parts and accessories. These two aspects are the primary and secondary areas of operation. In addition, Scott-Atwater also operates a physically segregated but on-the-premises factory branch to provide the services of a distributor to dealers in the area immediately surrounding the factory.

Thus, we have three types of order-invoicing operations. In each the basic accounting function is similar. We must provide for receiving the order, delivering the merchandise and charging the customer's account. Obviously, there could be numerous equipment and system applications designed for handling all of these operations on a uniform basis. However, upon deeper consideration of the differences as well as the similarities of these situations, we arrived at three distinct conclusions as to the most effective handling. This presentation briefly describes the characteristics and management considerations in each area which led to the adoption of the particular methods used.

Outboard motors are sold for the most part in carload or truckload lots to approximately fifty distributors at an average price in excess of $250 each. Eight horsepower selections in seven colors, with additional options of electric starting and length of driveshaft, are available. An identifying serial number is given to each motor. In order to encourage "off-season" buying, a discount program, changing monthly, is offered. This, of course, is the big dollar area.

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characterized by relatively few but large invoices. Management's chief concerns are to know the amount of these sales as soon as possible as an aid to production planning and also to be sure that each motor shipped is properly and promptly billed so that cash may be received without delay. Failure to handle properly one motor order can result in a loss in excess of the annual salary of a well-paid accounting clerk.

For this reason, we elected to account for these orders on a basis which would allow for maximum supervisory control. Accordingly, the function was segregated from all other accounting routines and assigned to an experienced billing clerk who was equipped with a billing machine. This clerk gives immediate and undivided attention to every motor order and is able to maintain high standards of speed and accuracy. Of course, we could have used our punched card equipment for the entire operation, but we would have lost the ability to deal with each order individually. Motor billing would have been required to "stand in line" with many other operations awaiting the attention of clerks who have many other reports to process.

In the process of billing and shipping motors, it is important that accurate records of serial numbers be furnished to customers and maintained by the company. These numbers are long and complex. Each time they are recopied, chances for error are compounded. In our motor billing system we have minimized these possibilities by providing a space on our multicopy sales order form for the shipping department to list these numbers manually as a part of the shipping routine. A count of these numbers also provides a double check on the quantity shipped. Another "trick" we employ in motor billing is to pre-figure the discount allowable and to enter the amount as a memorandum on the face of the invoice. This has eliminated nuisance adjustments which used to arise from customer errors in figuring discounts. Such errors were especially prevalent in our operation, because the rate of discount allowed on motor orders varies from month to month under a plan to encourage off-season ordering.

Parts and accessories, of which there are approximately five thousand different stock numbers, must be furnished to motor owners on a forty-eight hour basis. In a busy day, as many as four hundred orders or seven thousand order-lines may be processed. However, the average invoice is low in dollar amount. On this type of merchandise, normal terms of "net 10th prox" are allowable on all shipments. Since this is a service area, management is primarily

interested in fast service and subsequent detail information for inventory and production planning. For this reason, parts and accessory order-invoicing has been developed around tabulating equipment. Customer orders are transferred to punched cards and a shipping order-packing list is prepared. The cards serve as a control to ensure ultimate billing, since the same cards used in shipping order preparation are utilized in invoice preparation. After the invoices are run off, the cards are available for periodic sales analyses.

Again, our decision as to the basic system to use was dictated by the nature of the problems peculiar to the merchandise. Billing machines might have sufficed for billing alone, perhaps, but the ability of such equipment to produce the variety of sales analyses needed is severely limited. Only punched card equipment afforded the speed and flexibility necessary to handle the volume and detail involved.

The factory branch sells motors, parts and accessories direct to dealers in the area immediately adjacent to the factory. Although the branch is housed in the factory building, it maintains a segregated inventory and has separate shipping facilities. Some sales are over-the-counter-for cash, which introduces a special problem of control. The operation is extremely seasonal and a full-time person devoted exclusively to accounting needs is not justified, particularly in the fall and winter months. In this situation, control and economy were the governing factors in establishing accounting procedures. A simple "wiz" machine with a handwritten, prenumbered, continuous invoice form was the answer.

This machine has been ideal for use at the counter by an office girl who has many other duties or, in her absence, by a stockman. Cash-register-like control is provided, since the customer is given an invoice copy for every transaction and the factory accounting office accounts for every invoice number daily. Total sales for the day must equal cash turned in plus charges to the accounts receivable ledger. Nothing in this situation would preclude a system design which would integrate with the procedures previously described, at some point. However, we chose to apply a simple system to a simple operation—and are happy with the result.

As indicated by the foregoing examples, at Scott-Atwater we have resisted the temptation to become committed totally to any particular type of accounting "hardware" or system. We believe that our role as accountants is to control, analyze and report. Our systems should be designed only to serve these ends.

An Environmental Framework for Break-Even Analysis for Planning

by PAUL E. GREEN and S. REED CALHOUN

THE APPLICATION OF break-even analysis has progressed a long way but it would appear that the full potentialities of this tool have only begun to be tapped. Although broadening the scope of break-even analysis can well produce additional analytical and data-gathering problems, it is felt that the flexibility and conceptual ease of this technique more than make up for the increased burden on the analyst. The purpose of this paper is to relate in non-technical terms the extensions which can be made to break-even analysis. Description will be be utilized for this rather than the (possibly foreign) terminology of the mathematician. The extension of the technique will first be presented here in broad terms. Then, an example will be covered which will show, operationally, how the procedure could be employed. What is envisioned is the very real possibility of employing break-even analysis in problems of overall corporate planning, both short and long-term.

A Company's Environmental Relationships

No going concern operates in a vacuum. Industrial giants and small firms alike are subjected to external influences on sales, costs and profits. Although these factors are both numerous and complex, their relationship to the company can be considered in the two broad categories of influence originating in the economy and in the industry. Here these are called the economy-industry relationship and the industry-company relationship. There is a third relationship, dependent partly on these and partly on internal company factors. This is the sales-profit relationship.

Factors in the general economy (as measured by statistics such as gross national product, national income, capital equipment expenditures and the Federal Reserve Board index of industrial production) exert influence on an indi-

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vidual company primarily through the industry of which that company is a part. We can, thus, first consider the effect on the industry resulting from changes in the general economy factors. A forecast increase, say of ten per cent in capital equipment expenditures, can mean a marked change in the steel industry outlook while virtually no effect would be expected in the custom chinaware industry. The industrial economist, then, must first relate the influence of these economy factors to his specific industry. For brevity, this can be called the economy-industry relationship.

Going one step further, we can now view the company in the setting of the industry of which it is a member. Although the suggested increase in capital equipment expenditures may produce a change of so many million dollars in total industry sales, the effect on the individual company can be quite different from the industry pattern. This effect is influenced by the company's share of the total market and the similarity of the company's product mix to the classes of goods for which the capital expenditures are being made. In this setting, which can conveniently be termed the industry-company relationship, the individual firm can exercise (within the limits of its resources) a greater degree of control over its position. Advertising outlays, market research expenditures, new product development and extension of marketing territories all represent possible means by which the company can better its market share or its industry-company relationship. The exercise of these devices requires a considerable amount of resource planning and knowledge, not only of the various trends making up the economy-industry relationship, but also of their effect on the place of the individual firm in its industry. In addition, competitive action and counter-action must be considered in laying out strategy to improve market share.

Up to this point the company economist and/or market analyst will probably assume the role of data-gathering, time series correlation, trend analysis and the like, inasmuch as the primary concern here is with the effect of external factors on the firm's sales volume and sales mix. However, we lead in at this point to the third relationship.

The results of the first two relationships must be coupled with an internal analysis so as to derive the company's sales-profit relationship. At this juncture the cost accountant plays an important role in the determination of fixed and variable cost elements, contribution to profit and overhead, alternate product mixes and other appropriate measures of internal performance. Each one of the relationships (i.e., economy-industry, industry-company and sales-profit) must then be interwoven so as to complete the over-all planning frame-work in which one can trace the effect of changes in each one of the relationships on corporate profits. This structure is summarized in Exhibit 1.

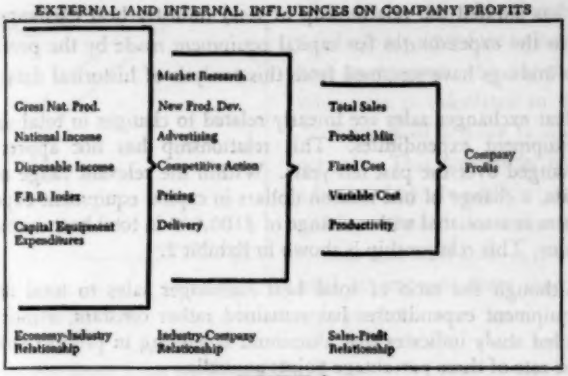

EXHIBIT 1

An Example: Development of the Alternatives

To illustrate how the framework is built up, a hypothetical company making one product will be chosen. Over-simplification will be resorted to in this exposition so as to more clearly emphasize the role of the break-even chart. The data used will be fictitious. Throughout the analysis, however, one can relate this example to his own firm's particular frame-work and, in so doing, perhaps better grasp the implications of the procedure.

The Athenian Corporation manufactures one product class—heat exchangers. These capital equipment items are sold primarily to the process industries and are used in the manufacture of petroleum, chemical, pulp and paper, pharmaceutical and beverage products. The Athenian Corporation enjoys annual sales of 10 million dollars, presently has ten per cent of the total heat exchanger market and makes a profit before taxes of $2 million. However, in the heat exchanger industry, there is a relative newcomer—aluminum. Some of Athenian's competitors have already begun to fabricate and sell aluminum heat exchangers. Athenian is the conservative in the industry and has up to now made only steel heat exchangers. Presently 15 per cent of expenditures for heat exchangers are for the aluminum variety and 85 per cent are for steel. Thus, Athenian's 10 per cent of the total market really represents 10/85 or 11.8 per cent of the steel heat exchanger market and 0/15 or 0 per cent of the aluminum market.

Preliminary study by Athenian management revealed that engineering and production know-how required in working with aluminum are such that entry into this type of manufacture would require an annual addition to fixed cost of one million dollars in research and special equipment and there would be a gestation period of one year before active market penetration could be effected. Athenian's

economist has studied the relationship of total industry heat exchanger sales to variations in the expenditures for capital equipment made by the process industries. Two findings have stemmed from this analysis of historical data:

1. Heat exchanger sales are linearly related to changes in total capital equipment expenditures. This relationship has not appreciably changed over the past ten years. Within the relevant range of the data, a change of one million dollars in capital equipment expenditures is associated with a change of $100,000 in total heat exchanger sales. This relationship is shown in Exhibit 2.

2. Although the ratio of total heat exchanger sales to total capital equipment expenditures has remained rather constant, a more detailed study indicates that aluminum is gaining in product share at the rate of three percentage points annually.

EXHIBIT 2

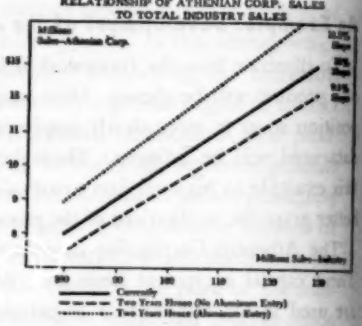
RELATIONSHIP OF ATHENIAN CORP. SALES TO TOTAL INDUSTRY SALES
Millions Sales—Athenian Corp.
Millions Sales—Industry
Two Years Hence (No Aluminum Entry)
Two Years Hence (Aluminum Entry)

EXHIBIT 3

Consultation with the marketing staff indicates that aluminum heat exchangers are expected to garner an additional three percentage points annually of total heat exchanger sales over the next five years, at which time the ratio is expected to stabilize at about 70:30 in favor of steel. Although Athenian's market share now represents 10 per cent of total industry sales, this share shows signs of declining unless Athenian either is able to capture a greater share of the remaining steel-fabricated class exchanger market or adds the aluminum variety to its line. Some present and projected industry-company relationships are shown in Exhibit 3.

A look into Athenian's internal structure shows that annual fixed cost amounts to two million dollars. The ratio of variable cost to sales equals .6, i.e., for each dollar increase in sales, variable cost increases 60 cents. Under these conditions, the current sales-profit relationship appears in Exhibit 4 as a solid line.

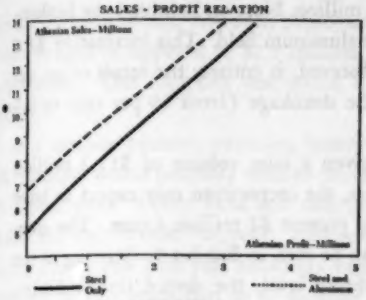

EXHIBIT 4

If, however, Athenian Corporation can satisfactorily produce aluminum-type heat exchangers, the variable cost to sales ratio is calculated to decrease to .56 because of a more favorable product mix. This appears in Exhibit 4 as a broken line. In addition, sales potential for Athenian in the combined aluminum and steel market is expected to total 20 per cent more than the steel-only market.

Extend the Product Line or Stand Pat?

Very broadly sketched, the preceding information represents the facts available to Athenian's management at the present date. As management considers these facts, it desires to know what Athenian's total profit picture would look like two years hence if no change is made in the product line and if the line is extended to include aluminum heat exchangers.

The economist then goes to work and forecasts that capital equipment expenditures will total $1.2 billion two years hence, thus yielding (based upon the economy-industry relationship) $120 million total industry heat exchanger sales. Since aluminum has now increased six percentage points to a 21 per cent share, the total dollar market consists of approximately $25 million for aluminum and $95 million for steel heat exchangers. If Athenian Coporation just holds its own in the steel heat exchanger portion, its 11.8 per cent of this part of the

ATHENIAN CORPORATION PROFIT OUTLOOK TWO YEARS HENCE
(Non Entry into Aluminum)

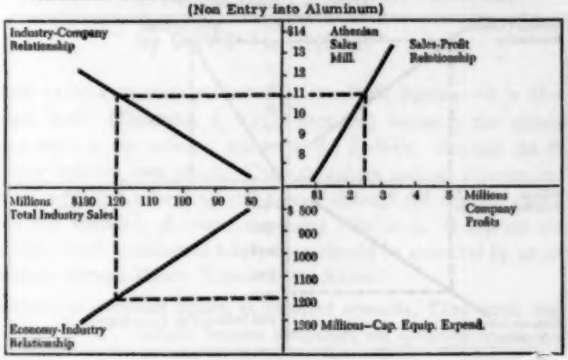

EXHIBIT 5

market will represent sales of about $11.2 million. Note on Exhibit 3 the broken-line graph representing non-entry into the aluminum field. This increase of $1.2 million over present sales, it should be observed, is entirely the result of an expanding market and obtains in spite of the shrinkage (from 10 per cent to 9.3 per cent) of Athenian's share of it.

From Exhibit 4, it can be seen that, given a sales volume of $11.2 million derived entirely from steel heat exchangers, the corporation may expect to have profits of about $2.5 million, as against a present $2 million figure. The step-by-step tracing of the sets of influences can be seen in Exhibit 5. Starting at the $1200 million capital equipment expenditure level, the dotted line indicates, by its intersections with the various graphs, total industry sales of $120 million, Athenian sales of $11.2 million, and Athenian profits of $2.5 million.

Now we can consider the case two years hence in which Athenian Corporation has presumably entered the aluminum market. Obviously, the economy-industry relationship remains the same at 10 per cent of capital equipment expenditures, leading again to projected total industry sales of $120 million.

However, Athenian's industry-company relationship has changed. Based on its potential in aluminum (20 per cent of $11.2 million) plus the steel share, Athenian's sales are expected to amount to $13.4 million or a resulting shift in the industry-company relationship equaling a total market share of 11.2 per cent as opposed to 9.3 per cent under the other alternative. (This is shown in the short broken line of Exhibit 3.)

Looking at the sales-profit relationship, fixed cost has risen from $2 million to $3 million, but the ratio of variable cost to sales has declined from .6 to .56 (changing both the slope and intercept of the sales-profit relationship). In

ATHENIAN CORPORATION PROFIT OUTLOOK TWO YEARS HENCE
(Entry into Aluminum)

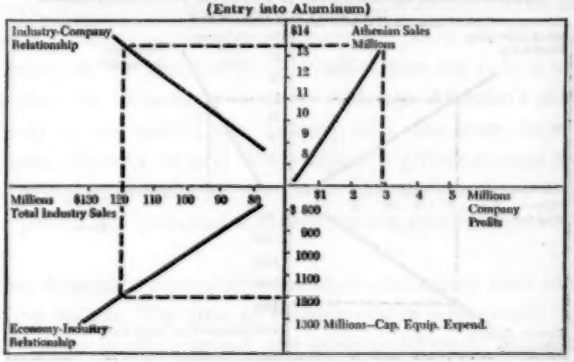

EXHIBIT 6

terms of total profit, however, Athenian would enjoy $2.9 million on $13.4 million sales as opposed to $2.5 million on $11.2 million sales under the other alternative. This complete description is embodied in one chart shown in Exhibit 6.

In a realistic problem situation, however, the analysis would hardly end here. The analyst would probably wish to calculate the respective sales volumes needed to "break-even" (since fixed cost and the ratio of variable cost to sales would differ for the two alternatives). Additionally, the interim year and perhaps the third, fourth and fifth year situations would be analyzed. These steps have been avoided in this exposition so as to more easily demonstrate the construction of the composite break-even charts from rather simple assumptions.

Working the Factors Into One Effect

Break-even analysis in this framework offers a real aid to the analyst in the consolidation on one chart of many factors affecting short and long-term planning. While the work of the analyst is not reduced (good data-gathering and correlation are more than ever required and one must still live with forecast error), the prime advantage of break-even analysis in this format appears to be in the ready summarization of information in a compact form. As such, it appears ideally suited to presentation to management of the overall effect of many complex factors on the lifeblood of the company—total profits.

DEPRECIATION AND THE "PROFIT SQUEEZE"

by DAVID H. LINDSEY*

THE RECENT ARTICLE IN TIME MAGAZINE, "The Profit Squeeze—It Is More Apparent than Real" (December 9, 1957, page 98) warrants the attention of accountants as much as the technical articles in the *Bulletin*. Through the *Bulletin* articles we look into our own minds. Through articles such as this one in *Time*, we look at the world of accounting and finance through the eyes of some of the consumers of our statistics. A rather surprising view it is. It appears that this particular article, which is discussed briefly here, should be answered by an accounting body, perhaps through *Time's* "Letters to the Editor."

With reference to corporate profits as reported annually, *Time* states that "the figures are misleading . . . simply because companies are spending so much money

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on replacement and expansion programs. . . . The standard method of gauging a company's health is to inspect its net profit—its earnings after all costs, taxes, depreciation, and interest charges are deducted. . . . Today, because of expansion, many economists, including those at the Federal Reserve Bank of Chicago, think that it gives a misleading impression. . . . The Chicago Fed argues that profit reports should not be limited to cash available for dividends and retained earnings, but should also include such things as depreciation, i.e., funds set aside to help pay for new plants and replacement—in effect, profits plowed back into the business. . . . On that basis, there is no profit squeeze. Gross margins have actually gone up. . . . One place where industry's billions for expansion show up is the book value of each company's common stock."

One need not dwell on the obvious misunderstandings set forth in this article. It states that profits reported are misleading but that the book value reported—which actually reflects profits reported—may be relied upon! It labels depreciation charges as funds set aside to pay for new plants and equipment, whereas depreciation is an amortization of a deferred cost, with no funding necessarily implied.

The kind of logic shown in this article is apparently a flight of wishful thinking which takes off from the groundwork laid by a practical necessity faced by security analysts in making comparisons of oil companies. Due to widely varying practices among oil companies in reporting depletion and exploration charges, security analysts have been forced to resort to adding back these charges and to producing "cash flow" statements. In the specific case of the oil industry, this expediency no doubt has value, but it is not applicable to buildings and equipment where costs are known and where serviceable life is estimated on a basis which is reasonably accurate. Presumably the economists of the Federal Reserve Bank of Chicago, as reported in the *Time* writeup, are looking at funds which may be generated by depreciation charges, as amounts to become available for future spending. This is important and true, but *Time* takes a wild leap when it infers that the amounts represent unreported profits.

There are many difficulties faced by accountants today, and few would say that profit figures reported are "correct" in an absolute, categorical sense. However, due to inflation, most of these difficulties lead to overstatement of profits rather than understatement. Depreciation provided by many companies is not adequate to replace equipment at today's higher costs. Profits for many companies which are on a "fifo" inventory basis arise, to a large extent, from the decrease in the value of the dollar rather than from real trading profits. An article which gives the impression that company profits are currently understated (except for unrecorded "profits" on fixed assets and "lifo" inventory due to the diminution of the dollar, which this article does not mention and which are inapplicable to the conclusions drawn therein) should not go unchallenged. A reply to clarify these misunderstandings would seem to be a public service.

Accounting for Residential Land Development Costs

by KENNETH B. WHITE

TODAY'S DEMAND FOR TOMORROW'S NEED for the development of sections of our rapidly growing country—a growth which has been particularly phenomenal over the past three years—will continue to present builders and city officials all over the country with problems of first importance. Because the price of raw land has skyrocketed in recent years, and because there is a shortage of suitable land for community development, this growth is pushing such development to the suburban areas. Relatively few developers are fortunate enough to have been able to buy and hold land at yesterday's prices for tomorrow's use.

Future communities do not just happen. They are planned—carefully and tediously planned and previewed to best utilize the urban and suburban land —and at great initial cost to the developer. The trend is definitely toward well-balanced communities, not just housing developments. Thus, "balance" is essentially a tool to permit people to live relatively close together in a safe, healthy, and pleasantly-organized manner. As people and families have increased in numbers and as means of livelihood have changed, we have of necessity or preference come to live closer and closer together. Balance in a community is pegged to the proper division and utilization of raw lands for both public and private needs. This means the planned use for residential, commercial, and industrial purposes, rounded out with adequate shopping centers (both neighborhood and regional) and civic centers.

What Is Involved in Land Development for Residential Areas

Separate and special problems are encountered for each phase of the three principal types of urban land development—residential, commercial and industrial. The entire field is much too large a subject to cover in one case study. Accordingly, only problems relating to the accounting for costs of land development for residential areas have been selected for presentation in this one.

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Also, for the present, there are excluded the separate problems of apportionment (among several developers on an area or community basis) of the excess costs of installing utilities to provide for future services in initially planned but still undeveloped areas, i. e., those which more than meet the immediate needs of a tract of land being developed.

Today, in almost every area of the country, the municipal administrators and the prospective home-owners are demanding that water, sanitary sewer, gas, and storm drainage facilities be provided. They are also insisting that schools, churches, parks, and recreation areas, and immediately-needed shops and stores be built or planned well in advance of the actual construction of homes. These requirements demand tremendous outlays of cash long before any return can be realized. Such initial cash expenditures make it impossible for the small builder to create building lots for himself. He must depend on the land developer to meet his lot requirements.

The ultimate aim of each residential land developer, that of turning raw land into usable residential lots complete with paved streets, alleys, curbs, gutters, and water and sewer taps for sale to builders and home-seekers, is generally the same. Although many of the problems confronting the developers are closely allied, the solutions are not necessarily achieved in the same way by all developers. The topography of the land tracts, local subdivision and building codes and regulations, and programs of financing play an important role in the methods of operation by land developers and the accounting for development and related costs.

Classifications of Residential Land Development Costs

Despite the real need and importance of maintaining separate accounts with adequate break-down by at least the prime classifications of costs, some accountants for residential land developers still take the easy way out by accumulating or assembling all costs in a single amount (generally separately for each parcel of land) before determining the apportionment to the lots which are sold and unsold. Obviously, such accounting is of little value to the larger developers in providing the means of controlling these costs by comparison with related costs of their own or other developers' subdivisions, etc.

There are listed in Exhibit 1 the accounts for prime classifications of costs as identified in this study, which probably should be maintained for adequate accounting for development costs (including land costs), and there are also listed some of the principal costs underlying these prime classifications. Special attention is directed to the "credits" which, under certain optional accounting

LAND DEVELOPMENT COST CLASSIFICATIONS

1. **Land costs:**

   Actual purchase price of acreage acquired.
   Legal, abstract, title policy, and other title fees (relating to acreage acquired).
   Interest and property taxes incurred prior to acquisition (relating to acreage acquired).
   Land improvements (except where applicable to utility, pavement, and other costs accounted for under separate classifications):
   Bulldozer and other equipment work (grading, leveling, excavating filling, terracing, etc., including equipment rentals).
   Removal of weeds, brush, grass, and trees (or rather, thoughtful conservation of existing trees).
   Other direct improvements to site and terrain including landscaping, planting, etc.
   Cost of easements.
   Credits:
   Amounts received from easements.

2. **Water system costs:**

   Costs of water mains and appurtenances (water main pipe, gate valves, deadhead services, fire hydrants, fittings, concrete, etc.).
   Credits:
   Amounts refunded for connections serving consumers (entire cost or pro rata thereof may be refunded at a fixed amount for each consumer, usually under contracts with municipalities).
   Amounts refunded from sale or dedication of sites for schools, parks, recreation areas, etc.

3. **Sanitary sewer system costs:**

   Costs of sewer mains and appurtenances (sanitary sewer main pipe, street laterals, manholes, cleanouts, wye connections, concrete, embedment, granular material, etc.).
   Credits:
   Amounts refunded for connections serving consumers (entire cost or pro rata thereof may be refunded, at a fixed amount for each consumer, usually under contracts with municipalities). Amounts received from sale or dedication of sites for schools, parks, recreation areas, etc.

4. **Gas system costs:**

   Costs of gas main extensions if not recorded as accounts receivable (usually under contracts with public utility companies).
   Credits for amounts refunded for connections serving consumers (entire cost may be refunded, at a fixed amount for each consumer, under contracts with public utility companies.

5. **Storm sewer system costs:**

   Costs of storm sewer and appurtenances (storm sewer pipe, manholes, wye connections, inlets, headwalls, concrete, etc.).
   Credits for amounts received from sale or dedication of sites for schools, parks, recreation areas, etc.

6. **Pavement costs:**

   Costs of street, alley, and sidewalk pavement, curbs, clearing of right-of-ways, and excavation and disposal of earth, rock, etc. (including rentals of related equipment).
   Credits for amounts received from sale or dedication of sites for schools, parks, recreation areas, etc.

7. **Engineering costs:**

   Fees of land planners.
   Engineering costs of preliminary and final surveys, plats, maps, and plans, including those for water, sanitary sewer, and storm and drainage sewer systems, street and alley pavement, etc.
   Costs of prints of plats, maps, plans, etc.
   Fees for filing plats, maps, plans, etc.

8. **Carrying charges - Subject to right of election by the the developer to treat as current expenses when incurred or to capitalize as part of the development costs (basis) for subsequent charges to income as the lots are sold:**
   Interest on mortgage debt (incurred at the time the land was acquired or subsequently under new financing).
   Interest on loans and notes executed for money borrowed to provide funds to pay for land development costs.
   Taxes:
   Property taxes assessed by states, counties, cities, school districts, etc. on land and development work.

9. **Miscellaneous development costs (exclusive of any costs which may be attributable to and otherwise classifiable as administrative and selling expenses):**
   Field office costs (other than when used by salesmen).
   Initial costs or fees for pre-operating costs of street lights during land development work periods.
   Costs of mowing grass, clearing weeds and brush, and watering landscaped areas (subsequent to the initial development costs charged to "land costs" - if not considered as selling expenses).
   Accounting and general office costs (pre-operating costs directly applicable to costs during the land development work periods).

EXHIBIT 1

methods for income tax purposes, will not be used in cases in which the deposit portions or otherwise refundable or recoverable portions of the costs are recorded on the books as accounts receivable at the time that the original expenditures are made, as sales when easements are sold or granted or when areas are dedicated or sold for schools, parks, recreation areas, etc., or as direct credits to income when received (not necessarily in the same accounting year in which the original costs were incurred). They will be used only under accounting procedures for which the credits are not applied directly as reductions of the costs maintained in separate accounts for each of the prime classifications.

Initial Problems in Accounting for Lot Costs

For Federal income tax purposes, it has been held that, where a tract of land is subdivided and sold, the costs for the tract must be equitably (not ratably) apportioned to the several lots within a tract or parcel of land which is subdivided into installments or further into lot groups. The developer and the seller are not permitted to wait until these costs have been recovered before reporting the gains. The realized and unrealized gain (profit) or loss must be measured on every lot group sold, on the basis of a fair and equitable apportionment of these costs. The Treasury Department and the courts have consistently refused to find this apportionment impossible in the case of real estate. Accordingly, the accountant must maintain accounts for these development costs for a residential tract in a manner which will provide this apportionment and breakdown of the costs by lot groups or by individual lots.

Usually, but not always, each instalment in a tract of land is developed separately. However, particularly for the smaller developer, all the classes of utilities and improvements for each instalment may not be completed simultaneously because of the development requirements for adjoining instalments or areas or because of insufficient funds under the prevailing financing. For example, a street or an alley or utilities serving certain lots in one instalment may be left unfinished until development in an adjoining instalment is undertaken. In view of these possible incomplete stages of development, it is important to maintain separate accounts for at least the prime classifications of costs for each specific lot group within each instalment, in order that the costs may be charged solely to the land units to which they apply. The costs covering more than one instalments, such as over-lapping costs of water, sanitary sewer, and storm sewer systems, street pavement, engineering work, etc., are to be apportioned fairly (possibly by means of the use of an apportionment account) to the cost accounts of the respective instalments and, ultimately, to the underlying lot groups.

However, before any attempt is made to apportion the development costs to the individual lots, there are some initial problems to be considered with respect to the accumulation of these costs within the prime classifications, applicable to the various lot groups in the entire tract to be developed. For example, a developer may purchase a tract of land so varied in character that he would pay prices varying from the composite price if he purchased separately the lots within the tract. Thus, it may not be deemed fair and equitable to allocate the original land costs equally or ratably among all the lot groups in a tract of land. There is the question of the equitable value, if any, of the unsalable waste areas and of areas which require considerable dirt-fill or bulldozer work. The developer may not

receive all, or perhaps any, of the costs of the land dedicated for school, park or recreational purposes. Decisions must be made as to whether the amounts received for this land should be treated as sales or as reductions of the costs, to be spread over the remainder of the tract. All such facts must be considered very carefully in determining the division or apportionment, by proper weighting, of the land costs among the lot groups in the total tract.

The developer must also decide which method is to be followed in accounting for the refunds receivable in respect of the consumer connections on water, sanitary sewer, and gas mains. At least two methods, each with variations, are commonly used to account for such refundable development costs. They may be recorded as accounts receivable and thus relieve the amounts charged to the development cost accounts of this portion of the incurred costs. A variation of this method is to record as a net receivable, possibly by means of a reserve account, only that portion of these costs which is expected to be collected in view of the prevailing facts and the economic conditions. Accounting-wise, either of these methods is desirable for the purpose of producing more accurate lot costs, particularly if the development costs are maintained on an individual lot basis.

Another commonly-used method, particularly since it is permitted for income tax purposes, is to apportion these development costs entirely to the lot costs without recognizing the refundable portion until collected. If this method is followed and no refunds have yet been received, the costs will be recovered out of the first lot sales (to the extent of the portion included as costs of the lots sold). Then, the amounts received subsequently as refunds must be taken entirely into income in the tax year received (which may result in fluctuations, between years, of the gross profit from lot sales). The variation of this method followed by some developers is to credit the unabsorbed costs applicable to the remaining lots unsold with the amounts of the refunds, taking the resulting net costs as a charge to income (gross profit) as the remaining lots are sold. Of course, this variation results in periodic fluctuations and adjustments in the lot costs (either for lot groups or for individual lots).

As has been stated, the developer has the right of election to treat the amounts of certain interest and taxes as current expenses during the year in which incurred or expended or to capitalize these amounts as portions of the initial or subsequent development costs (basis) to be recovered equitably only upon sale of the lots. Again this is a matter of decision, dependent perhaps upon the other business ventures or the taxable income of the developer. From an accounting viewpoint, it may seem incorrect not to consider these amounts of interest and taxes as part of the costs of the developed lots; yet the tendency, probably followed by most developers, is to expense these costs so as to obtain cur-

rent savings or reductions in the amounts of the income taxes to be paid—seemingly of first importance in the development business.

Apportionment of Costs to Lots or Lot Groups

After all of the initial problems have been carefully studied and decided upon, both accounting-wise and income tax-wise, the developer is ready to consider the various methods which may be used in determining the amounts of development costs to be apportioned to each lot group or to each individual lot. Some of the commonly-used methods are those which provide for the apportionments of the accumulated development costs upon the bases of the totals—for all lots in the lot groups—of the following:

1. Tentative selling prices.
2. Assessed values.
3. Number of lots.
4. Frontage feet.
5. Square feet.

Under each method, it should be borne in mind that the apportionments may be made by means of maintaining separate accounts for each of the prime cost classifications for each lot group or in total by one unclassified cost account for each lot group. Also, these apportionments may be made separately for each lot, if so desired, or in total for each lot group.

Apportionment by *tentative selling prices* prorates the development costs of lot groups on this basis and is frequently more equitable than any of the other methods. It seems to be acceptable for Federal income tax purposes. The total cost of all the lots in the lot group, divided by the total of their tentative selling prices, will produce a fixed or uniform percentage to be used in calculating the cost of these lots. Thus, if the ratio of the development costs to the total of the tentative selling prices is 60 per cent, that percentage will be applied to the tentative selling price of a lot in order to determine its development cost. If separate costs are not maintained or desired for each lot, the formula may be applied to the total of the tentative selling prices (not actual sale prices) for all the lots sold out of a particular group.

Under this method of apportionment, the lot costs may require adjustments when certain circumstances arise. The original aggregate development costs for the lot group may become changed as a result of additional costs or corrections of costs not known when the original percentage was determined and applied to the first lots sold. If adjustments of the costs on lots already sold are not deemed feasible (because of different tax years, etc.), a new percentage may be obtained for the remaining unabsorbed costs applicable to the unsold lots in the lot group, or the actual sales prices of some lots may differ from the tentative selling

prices assigned to the lots. Even so, in some cases, it may be undesirable or deemed unimportant to adjust costs already apportioned upon the basis of the actual sales prices and the tentative sales prices because of a general fluctuation caused by market conditions. In such cases, it may be more equitable to adjust all the costs (either separately by lots or in total for all lots sold) by computing a new percentage based upon the total of the actual selling prices for lots sold and the adjusted tentative selling prices for lots unsold.

Another apportionment method, also one which appears to be acceptable for Federal income tax purposes, is that under which the development costs of lot groups are divided among the lots upon the *basis of relative assessed values* (following the same percentage computations and proration procedures as stated for apportionments by tentative selling prices). The lot costs under this method are likewise subject to adjustments during the interim periods for additions to or corrections of the original development costs upon which the apportionment was computed. Another problem encountered under this methhod is that, in many instances, the developed lots may be assessed at values which do not recognize the fact that lots differ in size and location, and thus may differ in value. It has been noted that the assessed values, as determined by the various taxing bodies, (state, county, city, school district, etc.), are not always relative for the same lot or tract. Also, the assessed values often increase from year to year as the lots remain unsold, whereas the costs of the respective lots have not changed.

In apportionments by *number of lots,* an equal cost for each lot is obtained, since the apportionments are based upon the total development costs of each lot group, being divided by the total number of lots in such lot group. Obviously, in many cases, this method is inequitable when the lots differ in size, structure, and location (differences normally recognized in apportionments by accurate tentative selling prices). Where the development costs are determined on a total basis for all lots sold (rather than on an individual lot basis), adjustments for additional costs or corrections after the first lots are sold can be made easily under this method. These adjustments are determined by means of computing new dollar-per-lot costs upon the basis of the unabsorbed costs at the end of each period or year. However, in accounting for the development costs separately for each lot, it may be deemed necessary to make progressive recomputations of these dollar-per-lot costs.

The first step under apportionments by *frontage feet* is to obtain for the lot group the aggregate of the number of feet in the frontage of each lot in it. The total of the development costs for the particular lot group is then divided by this aggregate number of frontage feet to determine the average dollar-per-frontage-

foot costs for use in computing the development costs for each lot. In many cases, this method is inequitable, because the lots differ in loctaion within the lot group and no recognition is given in the apportionments to the comparatively excess footage on corner lots and the fact that the size of the lot is not necessarily in proportion to the frontage feet, because of lots which are irregular in shape (including those with big frontage and tapered back yards and vice versa). Additional development costs or corrections during interim periods can be taken into account by application of the recomputed dollar-per-frontage-foot costs to the aggregate of the frontage feet for all lots sold or, in cases in which separate lot costs are maintained for each lot, by application of the frontage feet of each lot.

As a starting point for apportionments upon the basis of *square feet*, the accountant must determine the number of square feet in each lot. Usually, the adjoining street and alley areas are excluded. If the square feet based upon exact computations by engineers is not readily available, a reasonably accurate computation can be made of the areas of the lots of irregular shape by means of dividing the lots into triangular areas (treating as triangles areas with short curved sides). The total of the number of square feet in all of the lots in the specific lot group, divided into the related total development costs, will produce the average dollar amount of costs per square foot in all of the lots. Thus, the development costs of each lot can be determined by application of these dollar-per-square-foot costs.

As explained in connection with apportionments by number of lots and by frontage feet, apportionments by square feet may not be equitable in some cases, principally because no consideration is given to the location of the lots within the lot group, particularly as to the corner lots. Some accountants feel that the method is undesirable because of the necessary time rquired to compute the number of square feet in each lot, where not readily obtainable from the engineers. A more serious computation and time-consuming problem is presented in respect of additional development costs or corrections during the interim periods, because of the necessary recomputation of new dollar-per-square-foot average of costs or of unabsorbed costs to apply, respectively, to the square footage of lots already sold during the interim period or to the square footage of lots still to be sold.

Maintenance of a Lot Ledger

A lot ledger, preferably one with a separate loose-leaf ledger sheet for each lot, may be kept for use as an inventory of all the lots in the developed or par-

tially developed tracts or lot groups. This ledger can be utilized fully as the complete underlying support, by individual lots, of amounts shown by the developer's general ledger accounts for development costs (unabsorbed), costs of lot sales, and sales of lots. Obviously, more flexibility of handling and assembling of accounting data can be obtained by means of separate binders or files of the loose-leaf ledger sheets for each lot group, divided into sections for lots "unsold," "sold," etc. The accounting data and other information recorded in this lot ledger should include at least the information in Exhibit 2.

CONTENTS OF A LOT LEDGER

1. Description recorded (partially by a duplicating process)
   - Name of instalment or lot group.
   - Lot and block numbers or letters
   - Size of lot - dimensions, possibly supplemented by a drawing or a portion of a plat.
   - Restrictions or legal data deemed necessary.

2. Costs
   - Entries, with appropriate dates and folio references, for the amounts (possibly by prime classifications) of the costs and adjustments apportioned to the lot.
   - Apportionment method used (supplemented possibly by basic computations).

3. Sales
   - Tentative selling price of the lot and any subsequent changes in such price.
   - Prevailing discounts, if any, to builders and others.
   - Sales transaction number.
   - Name and address of purchaser to whom lot is sold.
   - Entries, with appropriate dates and folio references, for the amounts of the sales proceeds received (including the gross sales amount, any discount, the water and sewer tap charges collected, as well as the amounts withheld for title fees and any other deductions affecting the sales proceeds).
   - Memorandum entries for the amounts withheld for customer's escrow deposits, pro rata share of ad valoram taxes, etc.

4. Profit
   - Entry for computed profit based upon the recorded costs and sales proceeds.
   - Closing entries, with appropriate date and folio number for the amounts closed (at the month-end, year-end, or other accounting period) to sales and costs of sales.

EXHIBIT 2

Developers Must Decide Own Needs for Lot Cost

The import of the procedures to be followed in obtaining lot costs must be decided upon by the developers and their accountants after carefully studying their needs, not only accounting-wise and tax-wise but also cost-wise. Some of the problems confronting developers in accounting for residential land development costs have been presented here. These deal with the apportionment of over-lapping costs of utilities and engineering covering more than one tract of land, the proration of costs of land of variable topography purchased at composite prices, the optional methods of recording refundable deposit portions or otherwise recoverable portions of the costs, the election to treat certain carrying charges for interest and taxes as current expenses or as capitalized costs, etc. In addition to these important problems and related accounting procedures and knowing that residential land development costs must be maintained in a manner to provide for equitable costs of lots sold and unsold, the developer must decide on the following:

1. Need of accumulating these costs in separate cost accounts for such prime classifications as: land, utilities, (water, sanitary sewer, gas,

and storm sewer), pavement, engineering, carrying charges (interest and taxes), and miscellaneous general costs.

2. Which methods to use as the basis for the apportionments of accumulated costs—tentative selling prices, assessed values, number of lots, frontage feet, or square feet.
3. Need of apportionments of these accumulated costs, either in total or separately by the prime classifications, to obtain the total or classified costs of each lot group or of each individual lot (utilizing a lot ledger to record such costs on an individual lot basis).

The ultimate decision as to whether or not to maintain classified accounts for development costs will hinge upon the strength of the desire to control such costs by current analytical studies, and by comparisons with the related costs of other subdivisions, either owned or those of other developers. It has already been said that future communities do not just happen, they are carefully and tediously planned to best utilize the urban and suburban land. The accounting methods available are a part of that plan intended to guide and guard the expenditures of these expensive development-dollars.

The Art and Practice of Pricing

by ALWYN M. HARTOGENSIS

PRICING IS A MOST COMPLICATED ART but interesting because of its many ramifications and its vital importance. In this field, the difference between well-developed theories and practical, successful application is very wide. In few cases do mathematical formulae for setting prices prove satisfactory. Moreover, except in central security and commodity markets, the conditions and data which should provide a guide to sound pricing are vague or are not entirely ascertainable. It is pretty much a game of blindman's buff.

Roles of Members of the Pricing Team

The accountant naturally thinks of setting prices for products or services in terms of a mark-up on cost which will provide a satisfactory profit. What that mark-up should be is usually a guess. Obviously, it must be an amount necessary to provide a sound price. It soon turns out that cost alone is not enough information on which to establish an intelligent price. But further discussion will show how the accountant can make a necessary contribution to the problem through his knowledge of costs and particularly the effect of volume on costs. Because volume also affects price obtainable from buyers, the market analyst also is an essential member of the pricing team.

The sales and advertising managers usually are among the leading members of the pricing team. The former can provide the market analyst with the opinions of the salesmen on the firing line with respect to market conditions. Further, any change in price requires increased selling and advertising.

The specialists in operations research will recognize opportunities for application of their art to the strategy of pricing. The large number of variables, including effect of price on volume, effect of volume on costs, effect of price change on sales expenses, as well as possible counter measures to price change by competitors, offer a worthy challenge to this new field of research.

The economist will recognize that all phases of the subject of pricing lie within his field of knowledge. He has contributed applicable theories. In free competition, sufficient data for application of these theories usually is not available to any

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individual competitor, yet they are valuable for an understanding of the basic forces which govern pricing. With this understanding and with some ingenuity in empirical application, pricing policies and practices can be developed which will contribute substantially to the profitability of any commercial or industrial organization.

Top management should be the leader of the pricing team. Not only do the different points of view and objectives of the other members require integration, but pricing policy must be determined with respect to the strategy to be followed and the long-range effect. Prices will have as great an influence on profit as costs, both immediately and in the future.

A Test Rather than a Basis of Pricing

Under normal circumstances, the capacity of the economy of the United States to produce almost any product or render almost any service is in excess of the effective demand for that product or service. In other words, the normal market is a buyers' market. He, rather than the seller, determines the price. The seller may quote the price but the buyer, in the long run, will determine what that price will be or how much will be accepted at any price. The buyer usually is not interested in cost to the seller. He might use it if he knows it as an argument to negotiate a lower price, but he is interested mainly in value, usefulness, or desirability of the product or service in question. The price he is willing to pay depends on—

1. The advantage of possessing the product or enjoying the service, considering the following satisfactions:
   a. Pleasure or prestige
   b. Comfort, convenience, or health
   c. Other necessity or desirability
   d. Prospective profit or savings from use or resale.
2. Availability of substitutes and their relative cost and usefulness.
3. Expected future cost.

Because sale will be made only when the foregoing requirements of the prospective buyer are satisfied, a mark-up on cost must result in a satisfactory price in these terms in order to result in a sale. Only after a price acceptable to the buyer is reached does the question of cost enter. Essentially, the question then is, can the product be made and sold at a cost which will leave a profit? However, the question is over-simplified here and will be expanded upon in discussing applicable economic theory. An extreme example of a buyer-determined price is the

case in which long-established custom has fixed an unshakable price in the mind of the consumer. The five-cent package of chewing gum is an example. A variation is the five-cent candy bar, for which price has remained virtually unchanged over the years, but the weight of the bar has been reduced and higher quality bars have been introduced at ten cents and more.

When there is a lack of information concerning the market for a product, as in a few cases, a "shot in the dark" at an acceptable mark-up on cost may be necessary. The sale of a new and unique product or a competitive bid for a unique contract, such as a construction project, are examples. However, in the former case, the price setter is governed by considerations of long-range strategy as to what the market will accept. Should he price high in order to recover development costs quickly and, at the same time, run the risk of encouraging new entrants into competition by reason of the high profit margin, or should he price low in order to discourage new entrants, recovering development costs over a such longer period? In the latter case, a competitive bid is often at an amount believed to be sufficiently low but no lower than considered necessary to obtain the contract. If this bid will not provide the usual margin of profit above cost, the bidder must decide whether the attendant prestige of acquiring or performing the work or the necessity of keeping his organization employed warrants acceptance of a smaller profit or a limited loss. Cost plus a standard mark-up is a particularly vulnerable practice in contract bidding. It may provide a needlessly low bid or, if used habitually, may tip off competition to the company's pricing method.

There is available one seemingly objective method of determining a suitable mark-up on cost, which should be mentioned and the pitfalls which it contains when applied to competitive business explained. This method is that of pricing for return on capital employed. It may not be easy to determine the optimum price to ask for a manufactured product, but it is relatively easy to determine the earnings or rate of return on capital employed required to attract new investment to the company if needed for expansion. Along these lines a price total cost can be established at a rate which will provide a satisfactory return on capital employed. This is the principle followed in regulation of public utility rates.

The approach may work in a few cases but should not be regarded as available. In fact, although total revenues of a regulated public utility are established on the basis of costs plus return on investment, the rates for individual classes of services are actually based on other considerations, particularly elasticity of demand. Large industrial electric customers may have to be offered rates which

do not include full allocations of joint fixed costs. Otherwise they would install their own power plants and the costs to the remaining customers would be higher. In the case of non-regulated industry, it is obvious that the inefficient high cost manufacturer cannot charge a higher price than his efficient competitor merely in order to earn the same rate of return. Moreover, an attempt on the part of any company to earn the same rate of return on all products probably would fail, since it would price some products out of the market. Further, fluctuations in supply and demand make consistent application of this method impracticable. The gyrations of the market and price for copper during the past two years provide an excellent example. The use of aluminum and other substitute materials will affect demand for copper in the future. So also would discovery of large new bodies of copper. Although prices of manufactured products and of services are not as volatile as those of basic raw materials, they are not immune to like change, as witness the volume of sales and profits of automobile manufacturers in each of the past few years. Demand fell and unabsorbed fixed costs were reflected in greatly diminished profit.

Characteristics of Natural and Administrated Markets

"Natural" prices in central commodity and security markets reached by interplay of buyer and seller, contrast with "administered" pricing by a seller. In central markets, the quantity offered and the quantity demanded at each offer, together with the bid price, are shown. Sales are consummated at the prices and in the quantities at which offers and bids coincide. The effect of this knowledge is apparent in the operation of securities markets and is illustrated by different arrangements in these markets. For example, the span between bid and asked prices on an organized exchange is considerably less than on the over-the-counter market. In administered pricing, on the other hand, information is incomplete to both buyer and seller with respect to the total market for the product and the quantities which will be offered and accepted at various prices. Furthermore, since a seller, particularly a manufacturer, has incurred substantial "sunk" or inescapable costs, he cannot readily adjust supply to demand by withdrawing temporarily from the market when demand is weak. He is forced to accept marginal prices when the loss involved is less than the loss from shutdown. For the same reason, he is forced to recoup these losses by taking advantage of favorable conditions when he can.

Commodities sold on central markets or exchanges usually are fungible i.e., one item may be substituted for another in the sale. Any bushel of a certain grade of wheat or any share of a particular issue of capital stock is, for practical

purposes, the same as any other. Products and services sold under administered pricing are more often unique. A Ford is not necessarily as acceptable to all buyers as a Chevrolet. This is where marketing expense enters the picture in administered pricing. A necessary purpose of advertising is to convince the prospective buyer of differences between competing products, e.g., that the seller's product is superior, cheaper, or in some way a better buy than any other. The salesman can use the same evaluation data to convince the prospective customer of the worth of his product in relation to price. This suggests pricing, where possible, on the basis of the evaluation of differences between the seller's product and its competition. An example of this method of pricing (commerical aircraft) is offered later.

Economics of Pricing for Maximum Profit

We have considered, briefly, the place of cost in pricing and the features of markets. Another pertinent element in pricing is an understanding of economic theory of prices to serve as a guide, although it does not provide magic pricing formulae. A general rule is that for any commodity or service *at any one time*, a lower price will result in sales of larger quantity and a higher price will result in sales of smaller quantity. (Understanding of this rule should not be confused because of the fact that *at different times* both price and quantity sold may be higher or lower.)

The relationship of change in sales volume (quantity) consequent to change in price is a measure of elasticity of demand. If the percentage change in quantity sold is greater than the percentage change in price, demand is said to be elastic; if less, it is said to be inelastic. If a change of five per cent in price results in a change (in the opposite direction, of course) of ten per cent in quantity sold, then demand is elastic with an elasticity factor of two. If a change of ten per cent in price results in a change of only five per cent in volume, the elasticity factor is one half. An elasticity factor of less than unity represents inelastic demand. Generally, where demand is elastic, lower prices and profit margins with greater volume of sales yield higher profits. Where demand is inelastic, higher prices and larger profit margins with lower volume yield higher profits. Obviously, the benefit resulting from higher volume at lower unit profit margins is most apparent where fixed costs represent a relatively large proportion of total cost and may be realized to the extent of available capacity or low-cost addition to capacity.

This situation would provide a simple pricing formula if only we could measure elasticity of demand with sufficient accuracy, and provided also that the

elasticity factor were fixed for price movements in any amount and in either direction. Unfortunately, such is not the case. For example, an increase in price of five per cent may result in a quantity loss of twenty per cent. At the same time, a reduction in price of five per cent may result in increased quantity sold of only seven per cent. A reduction in price of ten per cent may increase volume seventeen per cent. Moreover, a price reduction might bring increased volume only after an intensive selling and advertising campaign, particularly when the increased volume must come from new markets. As for a price increase, it sometimes results in a substantial immediate loss of volume, followed by a gradual later recovery as customers adjust to the higher prices. Sometimes there is "false" gain. A gradually increasing industry-wide price structure often stimulates current sales at the expense of future sales as customers increase inventories to anticipate the price rise.

The action of competition will contribute to the intensity of effect on volume of a price change. However, the tendency will exist with or without direct competition, action by competitors, or similar action by all competitors. When demand for its product is elastic an entire industry can price itself out of the market or it can increase its total market by price action.

The classical expression of economic theory of the most profitable price following out these tendencies is that profit will be maximized highest at the price at which marginal revenues and marginal costs are equal. This statement requires explanation. Each reduction in price results in increasing the quantity sold and, when demand is elastic, i.e., the increase in quantity is at a faster rate than the decrease in price, an increase in total revenues from sales will result up to a certain point. Beyond this they will decline. The *net* increase in *total* revenues from each successive price reduction before the point of diminishing returns is reached is termed the marginal revenues. It is similar with costs. Depending on the ratio of fixed to total costs, unit costs will decrease, as volume is increased (within the limits of existing capacity), but aggregate costs (for the entire quantity sold) will increase. The *net* increase in *aggregate* cost from each successive price reduction is termed marginal costs.

When price is reduced from any price greater than the optimum (most profitable), still assuming elastic demand, both marginal revenues and marginal costs will result. Each successive price reduction, in equal steps, will result in smaller marginal revenue and in larger marginal cost than the previous step as long as price is above optimum. The last price reduction before optimum price is reached increases marginal revenues by more than it increases marginal costs. So it increases profit. The next step will increase marginal revenues by less than the resulting increase in marginal costs. So it will reduce profit. Therefore,

that step which results in equal marginal revenues and costs arrives at the price for maximum profit.

This theory is sound, but it is very difficult to apply it in practice. It requires the market analyst to determine, partly by interpolation, the probable volume to be obtained at each possible price within a reasonable range. It requires the accountant (and he should be able) to predict total cost with reasonable accuracy for any possible volume. From a few published articles on the subject, it appears that some companies, notably oil marketing companies with good market research facilities, use this technique to guide product pricing.

The marginal revenue and cost theory applies only to products with elastic demand. Demand for most products is elastic. However, demand for some products, e.g., table salt, is very inelastic. Another example of normally inelastic demand is in the case of a service "farmed out" to an independent company and representing a very small part of the total cost of an eventual end product, such as a dyeing plant for textiles. The cost of dyeing is insufficient to have substantial influence on the price of the end product, e.g., a shirt, and demand does not become elastic until the price of the service is raised to a point at which the mill or converter finds it desirable to install his own dye equipment.

Where demand is inelastic, the ceiling on price may be determined by competition within the industry but, if each member of the industry is conscious of the situation and of his own long-range interest, price-cutting will be held to a minimum. On the other hand, members of the industry are constrained to keep prices reasonable, in order to avoid inviting new entrants, with consequent excess capacity. There are special cases in which mark-ups on cost may well be calculated on the basis of what is required to obtain a fair return on investment as indicated by prices and earnings on the security markets. In this connection, distinction should be made between earnings on equity capital and earnings on total investments, including debt. Either may be used, but should be used consistently.

Practical Pricing — Some Examples

In the practical question of how to price a product or service held for sale, it should be evident that, ordinarily, there is a lack of market information necessary to apply economic principles directly to the calculation of a sound price. Theory indicates the direction of forces bearing on the problem rather than the intensity of those forces. Under these circumstances, the establishment of sound prices requires both judgment and ingenuity. The approach must be sought

which is best applicable to the particular situation. A number of examples will show the many broad lines of approach to sound pricing which are available.

Primary and processed metals companies have pricing problems typical of most industries producing basic raw or semi-processed materials for other industries. Contrary to some minority opinion which has received disproportionate publicity, the firms in each of these industries, although they may be few in number, are engaged in keen competition to maintain their respective shares of the market and its expansion, and to increase them, if possible. However, they are too well-informed to let this carry them to ruinous price-cutting.

In general, prices have been long established and the problem is largely with respect to changes in price. Price leadership, as a rule, is not resident in any one competitor, not even the largest, but any major firm might start a change in price for all or any products. If it is a price reduction, other firms may be forced to follow after it has been announced by firms with sufficient capacity to satisfy demand. In the case of an increased price, other firms usually follow, since such increases almost always follow increases in costs. However, on occasion, the rest of the industry has not followed and the increases have had to be rescinded.

Because of the relatively few firms which provide most of the capacity in each of these industries, there is more market information available, particularly with respect to supply, than in other types of industry. Price changes are made with fairly good knowledge of their effect on sales and earnings. Demand is only moderately elastic in the short run, but fixed costs are relatively high. Hence, volume is essential.

As a rule, price increases are initiated as a result of rising costs when it is believed that the effect of increases on volume will not negate the higher price. On the other hand, price reduction usually is initiated in response to falling demand, when it is believed that the reduction will improve demand to an extent which will compensate for the lower margins.

Men's shoes present a different picture. As in the case of many products, each grade or style range, at least for the short-run, constitutes a separate market. Over a longer period, there may be considerable switching by consumers from one grade or style range to another, such as when prices and consumers' incomes move out of step with one another.

A company planning to introduce a new line of men's shoes made an extensive market survey in which volume was forecast for various prices within the general range. From this survey, gross sales could be plotted with respect to price. It also estimated costs at these several volumes and plotted cost with respect to price. From these computations, it could determine the price range which probably would yield the best profit. Judgment was then applied, consid-

ering possible future price and cost trends and probable price action of competition. A price was established within the optimum range.

Commercial aircraft manufacture represents an industry in which the buyer is likely to study prices closely. A prospective purchaser of equipment for commercial or industry use is interested, to a major extent, in the contribution of the make and model selected to his present and future profit. He may be influenced partly by the prestige of certain models, particularly if his customers come into personal contact with the equipment, but profit will be the controlling factor. Transportation equipment in general and commercial passenger aircraft in particular are capable of evaluation in terms of potential earnings (or savings).

Because commercial passenger aircraft are individual and distinct revenue producers, and because adequate data on competitive makes and models are available, potential return on price (investment) can be calculated with sufficient accuracy to price any aircraft competitively. These aircraft are usually bought for a particular class of service and for a particular type of run (non-stop, limited stop, or puddle jumper). A predetermined schedule speed is required which may limit the selection but which seldom will dictate a single model. Usually there will still be several available choices.

Probable revenue-miles or revenue-hours of service per annum can be approximated by the manufacturer of any craft which can meet the route and service requirements. The expected load factor (ratio of passenger miles to seat miles) can be forecast. Therefore, it is not difficult to estimate the potential annual revenue of any plane on any prospective purchase. Likewise, every manufacturer can forecast the approximate operating and maintenance cost of his plane for the prospective service. (Administrative and general expenses and traffic expenses are related to the carrier, rather than to the aircraft, and so may be omitted from these calculations. Income taxes also may be omitted since they are affected by the manner of financing the purchase.) Return on investment will be the purchaser's profit before income taxes. The Civil Aeronautics Board requires from each carrier and publishes annually detailed statistics on revenues and costs by carriers and by types of aircraft. Since the current prices of competing craft are ascertainable, the rate of return on the required investment in competing aircraft can also be calculated. On the plane to be priced, depreciation will depend on price. Therefore, the depreciation rate must be added to the desired rate of return in capitalizing profit (before depreciation). The desired rate of return is any rate sufficiently higher than the available rate on a competing plane to provide effective price competition. By capitalizing the margin of prospective revenues over prospective costs, excluding depreciation, income taxes, and the irrelevant expenses mentioned, at a rate equal to the sum of the desired rate of

return plus the rate of depreciation, a competitive price is developed. Buying the craft at this price, the user will earn a higher rate of return on his investment than he can on a competing craft. (There may be several other expenses which, similar to depreciation, depend on price, such as ad valorum taxes and property insurance. If these are sufficiently material to affect the calculation, like depreciation, the rate may be added to the rate of capitalization instead of being included in deductions from revenues).

After the price of the plane is determined, working the calculation backwards, a comparative statement of estimated revenues, costs, and margin, the latter also expressed as percentage of price, can be prepared for the plane and for each of its competitors. If these calculations are reasonable and are supported by previous experience, the comparison furnishes a useful and effective sales tool. In fact, one advantage of pricing on the basis of value, when possible, is that a competitive sales tool is produced as a by-product.

Spare Parts are always difficult to price because the sale of the major item carries an obligation to provide spares in the future. In the example of pricing commercial aircraft, the price of spare parts is implied in the estimates used for future maintenance expenses. The airline which purchased a plane on the basis of the estimated level of operation and maintenance costs would justifiably resent an increase due to a higher price for spares, except to the extent that such increase were due to a rise in the price level.

Excessive prices on spare or repair parts, their unavailability when needed, or slow service in filling such orders may damage the reputation of the manufacturer and hurt the sale of the major product. On the other hand, it is costly both to maintain adequate stocks of parts for previous models or to manufacture them in small lots. It is necessary both to price them high enough to cover these costs and to be able to justify the price to the user.

In some cases there is competition in the sale of repair parts from independent manufacturers or the users' own maintenance shops. The automobile industry is an example of the former case. However, the supply of spare parts cannot be left entirely to independent manufacturers, since the manufacturer of the major item usually is expected to furnish such parts for old models for a certain number of years, and the independent supplier has no such obligation.

In general, the price of spare or replacement parts for transportation equipment and machinery appears to approximate four times manufacturing cost. This is very approximate and many exceptions can be found. It serves, sometimes, as a rule of thumb. However, it is desirable to price more specifically, if practicable. In one case in the writer's experience, one of the competing manufacturers who was longer established in the field could be considered as the industry price

leader. The most nearly corresponding parts of the products of the two companies were compared, the competitor's parts being reduced to a price per pound. This price per pound was further adjusted by a "complexity factor" as well as for differences in cost of the metals or alloys of which they were made, and the resulting adjusted price per pound was used for pricing. This method, and the derivation of a complexity factor, is explained further in the description of pricing earth-moving equipment.

Earth-moving equipment covers a broad line varying from moderately light to extremely large and heavy, such as shovels, ditchers, graders, bulldozers, and steel truck bodies. In general, no two firms in the industry carry exactly the same lines of equipment, but the many firms, some very small and others among the very large, overlap in different products. The equipment is revenue-producing, although in a different manner from aircraft, and its value to the purchaser (construction contractors for the most part) is measurable in a way. For example, one machine may be able to handle more cubic yards of dirt or gravel in an hour than another.

One moderately large company in this field establishes prices for its new products by comparison with competition on the basis of price per pound, modified for difference in materials, if any, and by a "complexity factor." Calculation of this factor involves some subjective judgment but is assisted by consideration of:

1. Number of surfaces on each part.
2. Number of parts in unit of equipment.
3. Relative estimated (or standard) labor hours to fabricate and assemble.
4. Relative cost of tooling.

After price is calculated tentatively on this modified weight formula, consideration is given to differences in value to performance capability, but price is modified only if it proves to be distinctly out of line and if costs seem to justify a lower price. The company was caught in a cost-price equeeze on one minor product line and elected to maintain a price near cost, pricing itself out of the market with respect to this item until a favorable change in market conditions took place.

During a period of rising costs, this company assumed price leadership in its industry by increasing its prices in proportion to cost increases. Its competitors did not follow until almost six months later, and as a result, complaints were received both from its customers and its salesmen. Prices had been increased on one product line at a time and the backlog of orders was watched carefully to judge the effect on sales. A mounting backlog of orders on all but one minor

product line indicated to management that its pricing action was sound, at least for the short-run. Subsequent action of competitors, as well as careful handling of price complaints, prevented any deleterious long-range effects.

In addition to the use of the backlog order report as a barometer, an independent market survey was made, among other purposes to provide a sales forecast for the ensuing fiscal year. This forecast was made in terms of units of each line which could be sold at both the old and the newly-increased prices. The survey showed that the quantity differences would be relatively small, with the result that total sales dollars would be higher at the higher prices on the smaller volume. Hence, profit would be greater. Incidentally, the sales forecast proved to be unusually accurate.

Summary of Influences on Pricing; What the Accountant Can Do

The principal problem in pricing is to determine the supply of the product or service to be priced, the prices at which it is being offered, and the demand or market for the product or service at various prices. Except for central markets, this information can be estimated only imperfectly. Cost plays an important but limited part. It indicates whether the product can be made and sold profitably at any price It does not indicate the amount of mark-up (or mark-down) on cost which will be accepted by the buyers in the market.

In general, price increases reduce sales volume and price reductions increase sales volume. The ratio of change in sales volume to change in price (called elasticity of demand), as well as the amount of fixed costs relative to the amount of variable costs, determines whether a lower price with high volume or higher price with low volume will be more profitable. Because of elasticity of demand and fixed costs, a price which is as high as the market can bear is not necessarily the most profitable price.

There always is a lack of adequate information available concerning open markets (in distinction to central or organized markets) and, as a result, pricing theory cannot be applied directly in most cases. As shown by the several examples given, application of sound judgment and some ingenuity is required.

The accountant can be a useful member of the pricing team. First, he should be able to predict the effect of changes in volume (which always accompany changes in price) on cost. Second, his trained business judgment should enable him to find sound approaches to pricing which will yield a successful competitive and profitable price.

MUST ALL ACCOUNTANTS BECOME STATISTICIANS?

by FRANK T. WHIFFEN*

THE INCREASE IN THE NUMBER of articles about statistical tools and methods as applied to the field of accounting, appearing in such highly regarded accounting literature as the *N. A. A. Bulletin,* the *Accounting Review* and the *Journal of Accountancy,* is indicative of a trend. We have been treated to various examples of specific uses of statistical methods, some technical discussions of the mathematics involved, and some generalizations as to the potentials of the uses of statistical methods.

The use of statistical tools as a basis of determining the credibility of finding of estimated fact without testing and measuring each item probably originated, in American industry, with the quality control engineers and the shop inspection departments. Experience has long shown inspectors that an individual part, as produced, can vary widely from the predetermined standards set for a given operation. The problem is to determine whether or not an item is an isolated variation or an indication that the process involved in the operation has broken down to the extent that an unacceptable quantity of deviating items are being produced. The decision has had to be based on experience or testing each item. The necessity for an alternative method was magnified during World War II when the shortage of qualified, experienced inspectors became acute. As a result, the use of theory of probability and the techniques of sampling came into widespread use.

A machine or tool—in the instant discussion, a mathematical formula—can do or determine only that which it is told to do or determine. No one will be so facetious as to propose that machines or formulas can replace men. However, man, in the exercise of his judgment based on experience, is subject to many influences generated by his capacity to think. One has only to contemplate the variation among us of the ability to remember in order to have some comprehension of the influences to which our judgment is subject. Although a machine is subject to wear, tear and abuse, as man is, a formula is not, and will always do as it is told. It does not have to be repaired, lubricated, tested or adjusted, nor is it subject to loss of memory. A formula, being the product of the science of mathematics, often referred to as the most exact of the sciences and always the tool of the other sciences, is, therefore, the best producer of a criteria upon which to base decisions. The application of formulas to accounting is the application of scientific methods and principles to the accountant's work.

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A relatively recent development in the field of management, i. e., management by exception, underscores the usefulness of statistical tools. Briefly stated, the underlying principle is that a manager should devote time and effort only to situations at variance with the expected. The application of statistical tools to the accountant's work can predict the expected, point out the exceptions, and identify those which are of a magnitude to require management's attention. Without these statistical tools, management is in the position of the inspector who has to base his judgment entirely on his experience and subject, therefore, to all the vicissitudes of man's mental processes. This is not to imply that we now have a formula which can take over the functions of management. In our dynamic society, it is unlikely that we shall ever know such a process. It would have to be entirely static, not involving human beings and not subject to change or development or the demands of the market place.

Nevertheless, the preparation and presentation of statistical analyses is a step in the development of our dynamic economy, that is still in its infancy. Despite many uses, this fertile field for development is relatively untouched. For example, in order to determine whether a variation from the budget is acceptable, a statistical analysis of the variation may be employed to determine the probability of the variation being within previously prescribed limits. The statistical analyst is capable of taking into consideration almost all of the factors which could have affected the item or items at variance. It can be fitted to a learning curve, a machine tool wear schedule, a change order and such other factors as production interruption, machine breakdown, or failure of material supply. Again, in the review of sales, statistical analyses can give us the probability that a given volume of sales will be attained, as affected by such nebulous variables as general economic conditions, population changes, increase or reduction in number of competitors and increase or reduction in advertising effort.

With the notable exceptions of the Departments of Commerce, Labor and Agriculture, the Federal Reserve Board, and some business analysis services, our economy in general has not yet completely accepted statistical analysis for what it is worth. However, every day we read of more and more applications for these tools. We find that they are getting better results, more economically, efficiently, and rapidly. The accountant does not need to be a mathematician nor a statistician in order that he may efficiently use statistical tools and enter these areas of analysis. A basic comprehension of their capabilities and limitations and, of course, practice in their application will enable him to present statistical analysis of the results of his work.

Control Accounting for Sponsored Research Contracts

by J. H. PFLIEGER, Jr.

SPONSORED INDUSTRIAL RESEARCH is defined to mean research work resolving scientific industrial problems to produce new ideas, new inventions, or new applications of existing inventions, which is done for outside customers and where it is expected that a monetary profit will be made out of the endeavor by the sponsor. (This definition does not intend to encompass educational institutions or no-profit foundations which are primarily interested in the advancement of knowledge.) The type of research pursued or performed may be basic research (blue sky), applied research, advanced development, or new product development.

Each research organization is molded and shaped by the nature of its fields of endeavor and the personalities of the men-in-charge, but there is nothing mysterious about the business-end of a sponsored research endeavor. If the tenets of all good business practices are logically applied, correct answers should be forthcoming. Laboratories organized for the particular purpose of performing research services may expect to realize their profit in one or more of several ways:

1. Increase sales of existing products:
   a. Make it better,
   b. Make it cheaper; or
2. Create and sell a new product that man will want to satisfy a need, and
3. Obtain patents and license others to manufacture on a royalty basis or
4. Sell the invention and assign the patent application and patents issuing thereon.

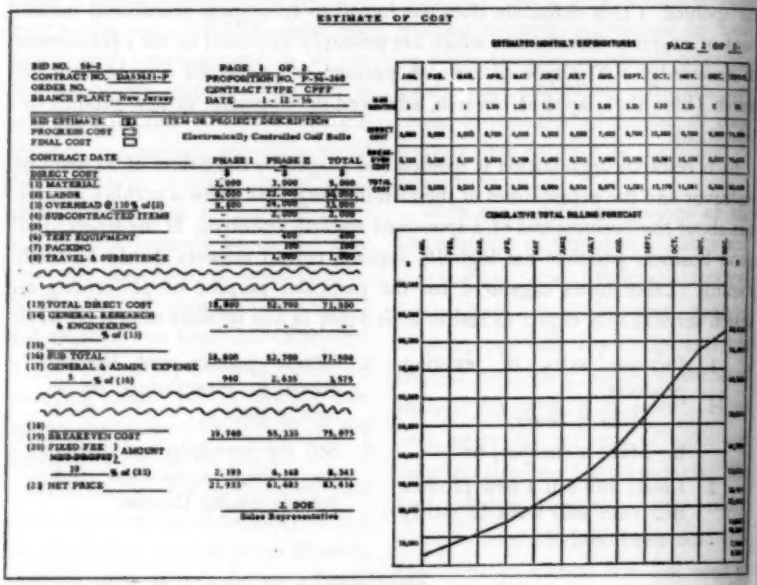
In sponsored research endeavors, it is sometimes desirable, temporarily, to perform tasks with a low monetary profit return, or even show a loss, because of the invaluable intangible scientific "know-how" obtained by engineering personnel. The work being done in the atomic energy field and the efforts expended on electronic computers in the last few years are some good examples of this today.

JOHN H. PFLIEGER, JR., Trenton Chapter, 1952, is Accounting Manager at the RCA Laboratories, Radio Corporation of America, Princeton, N. J. He has been affiliated with this company since 1935 and has served in various capacities in accounting and auditing functions. Mr. Pflieger is Past President of Trenton Chapter.

In the final analysis, it is expected that possession of this "know-how" will make possible large monetary profits in the future.

Research Proposals and Contract Approvals

Usually, in sponsored research there are no tangible finished products to display before the customer. Therefore, the contract representative has to present a sales proposal in written form. How does he go about it? A research project is ordinarily considered in two phases. First, the contract representative, who must have fairly comprehensive technical knowledge, has to gather all available information regarding the project and present it to the research engineers for review from a technical standpoint. The individual in charge of the particu-



ESTIMATE OF COST

BID NO. 56-2 — PAGE 1 OF 2
CONTRACT NO. DA19431-F — PROPOSITION NO. P-56-268
ORDER NO. — CONTRACT TYPE CPFF
BRANCH PLANT New Jersey — DATE 1 - 12 - 56

BID ESTIMATE ☒ — ITEM OR PROJECT DESCRIPTION
PROGRESS COST ☐ — Electronically Controlled Coil Rolls
FINAL COST ☐

CONTRACT DATE

	PHASE I	PHASE II	TOTAL
DIRECT COST	$	$	$
(1) MATERIAL	2,000	3,000	5,000
(2) LABOR	6,000	22,000	28,000
(3) OVERHEAD @ 110 % of (2)	6,600	24,200	30,800
(4) SUBCONTRACTED ITEMS	-	2,000	2,000
(5)	-	-	-
(6) TEST EQUIPMENT	-	400	400
(7) PACKING	-	100	100
(8) TRAVEL & SUBSISTENCE	-	1,000	1,000
(13) TOTAL DIRECT COST	14,600	52,700	71,300
(14) GENERAL RESEARCH & ENGINEERING % of (13)	-	-	-
(15)			
(16) SUB TOTAL	14,600	52,700	71,300
(17) GENERAL & ADMIN. EXPENSE 5 % of (16)	940	2,635	3,575
(18)			
(19) BREAKEVEN COST	15,740	55,335	74,875
(20) FIXED FEE) AMOUNT NEGOTIATED) 10 % of (19)	2,193	6,148	8,341
(21) NET PRICE	17,933	61,483	83,216

J. DOE
Sales Representative

ESTIMATED MONTHLY EXPENDITURES — PAGE 2 OF 2

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
SUB CONTRACTS	1	1	1	1.33	1.33	1.33	1	1.33	1.33	1.33	1.33	1	14
DIRECT COST	5,000	5,000	5,000	5,333	5,333	5,333	5,000	7,333	6,733	15,333	6,733	6,000	78,300
OVERHEAD	5,500	5,500	5,500	5,866	5,866	5,866	5,500	8,066	7,406	16,866	7,406	6,600	86,130
TOTAL COST	10,500	10,500	10,500	11,199	11,199	11,199	10,500	15,399	14,139	32,199	14,139	12,600	164,430

CUMULATIVE TOTAL BILLING FORECAST

EXHIBIT 1

lar research endeavor, then decides whether the project is a desirable one and whether proper personnel and facilities are available to accomplish the task in the time allotted.

If the sales and engineering staffs agree to go ahead with the project, an Estimate of Cost (Exhibit 1) is prepared. (For those readers who are interested in the details, all the figures on the specimen statements, Exhibits 1 through 10, are in correlation.) Cost estimating becomes difficult when you are trying to in-

vent or discover something which has not existed before. You are dealing with many intangibles. In fact, many research agreements are study problems designed to review the matter for a stipulated period and then to submit a report covering the findings. However, the estimated cost must be attractive to the customer and provisions must be made for future economic and legislative changes when the sponsored research will be performed over a protracted period of time.

Many contracts are on a cost-plus-fixed-fee basis because of the uncertainties surrounding the amount of work and time it will take to resolve intricate scientific questions. More usually, the fee remains fixed, even though break-even costs (cost of sales plus general and administrative) may be increased by extension of the contract. The only acceptable reason for requesting additional fee is proof of additional benefits because of an increase in the scope of the contract. However, as break-even costs increase in proportion to fee, the profit percentage decreases in direct ratio. Therefore, it is considered very important that the estimate of cost be prepared with the utmost care and all aspects of the contract be approved by the persons best qualified to do so before it is signed.

Drafting new contracts to cover research projects can consume many man hours

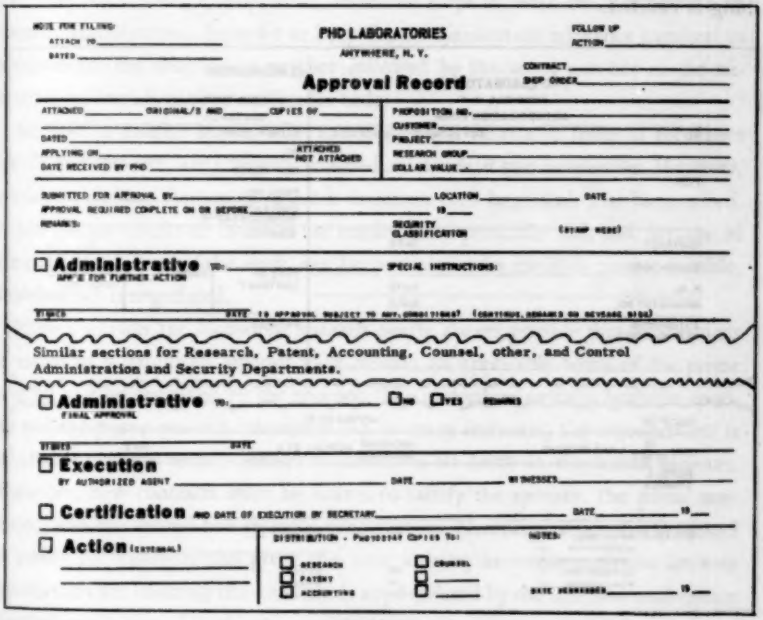

PHD LABORATORIES
ANYWHERE, N. Y.
Approval Record
Similar sections for Research, Patent, Accounting, Counsel, other, and Control Administration and Security Departments.

EXHIBIT 2

because research tasks are individualistic, complex, and cannot be subjected to the same rigid accounting and performance codes applied by the fabricators of consumer goods. One method of handling the contract problem is to draft up a basic agreement covering all contingencies and then amending it to meet the individual requirements of each project. The scope of the work, costs, records of inventions, patent rights, fees, etc., will vary, but a basic agreement assures uniformity of contractual obligations and saves preparation and approval time.

The individually-tailored research contract or basic agreement with all amendments, inserts, proposals, and estimates of cost is routed to the head of each department concerned with the research project for comment and approval. A copy of the Approval Record is shown as Exhibit 2. The individuals responsible for each phase of the approval procedure must be top-level men in their particular field, and must also be completely familiar with the aims and policies of the corporation, inasmuch as they are committing the corporation from a technical performance, a legal, and a financial standpoint. As in any other business enterprise, unwise commitments can prove disastrous. Anyone familiar with research agreements entered into with large industrial organizations or the U. S. Government for scientific research and development work is completely aware that everything is covered.

PHD LABORATORIES
ANYWHERE, N. Y.
AUTHORIZATION FORM

CLASSIFICATION:
AUTHOR. FORM:
CONTRACT:

TO _____ DEPARTMENT _____ LOCATION _____

FOR _____

AUTHOR. FORM _____ DATE _____
NO. _____
SHOP ORDER _____
PROF. NO. _____
CONTRACT REPRESENTATIVE _____
SUBJECT _____

CONTRACT		DATE	
SUBCONTRACT		DATE	
P. O.		DATE	
AMENDMENT NO.		DATE	
AUTHORIZED EXPENDITURES		EXPIRES	

TYPE OF CONTRACT	PRIORITY	TAX EXEMPT. CERT. NO.

ISSUED BY _____ APPROVED BY _____

THIS IS / IS NOT A NEW BOOKING — INCREASE / DECREASE BOOKING BY $ _____ TO $ _____

NOTES & SYMBOLS _____

DISTR.: PROJ. END. — ( ) PATENT — ( )
SUPERVISOR — ( )
CONTR. ADMIN. — ( )
ACCOUNTING — ( ) OTHER — ( )
PURCHASING — ( ) OTHER — ( )
( ) OTHER — ( )

EXHIBIT 3

Commencement of Research and Subcontracting

After the proposed contract has been approved by all pertinent company personnel and executed by the customer, active sponsored research commences. In a research laboratory, a job order cost system is normally followed. A shop order or work order number must be assigned and distributed in written form to all parties concerned so that all costs incurred on the task can be accurately accumulated for billing purposes. Contract work requirement specifications, security requirements, project expenditure forecasts, phase target date schedules, equipment and facility requirements, intermittent and final reports, and numerous other programming and scheduling problems must be tackled and resolved. An administrative group, allied with the sales group, can best accomplish the solving of these inter-related problems.

The form of communication used to transmit information to the researchers and their supporting staff is "paper-work." The number and type of forms required are dependent on the size and scope of the research laboratory. Nevertheless, the Authorization Form (Exhibit 3) is the type of form needed to start all wheels rolling on the job at the right time. All amendments to the task, i.e., completion date, appropriation, increased scope of work etc., are covered by contract authorization. In order to keep the communication reference numbers to a minimum, the shop order number followed by the serial number of the authorization form is used as a reference code.

Items of a routine nature, such as supplies and fabricated material for direct use on the contract, are normally handled by standard purchase order. However, outside consulting services or research assistance on a large scale may be required. When unique talents or facilities are needed for a particular task and, because of the restrictive nature of the work, regular purchase order methods are not suitable, a subcontract is negotiated.

Prime contracts for sponsored research nearly always provide that subcontracts in excess of a stipulated amount must contain all applicable terms of the prime contract and be approved by the sponsor. This procedure protects both the sponsor and the prime research laboratory but, in many instances, the subcontractor is reluctant to accept certain restrictive measures set forth in the prime contract. Therefore, new contracts must be drawn to satisfy the sponsor, the prime contractor, and the second-tier research organization. Naturally, subcontracts should be routed for approval and given the same scrutiny as prime contracts, because subcontracts are utilizing the total funds appropriated by the customer and reduce the total profits earned by the prime contractor.

When the prime contractor is a division of a multidivisional corporation in which each division operates as a separate entity on a competitive basis with the other divisions, intracompany profits must be eliminated in billing the work to the sponsor, and there is a substantial diversion of profits from the division which originated the contract to the division operating as a sub-contractor. Ordinarily, the division holding the prime contract will realize profit only on its own general and administrative expenses allocable to the contract. The financial presentation to reflect properly the profit resulting to the prime contractor for work subcontracted is presented in accepted profit and loss form on Exhibit 9, to be commented on later. Insofar as the intracompany transactions are concerned in preparing the final billing to the sponsor, the figures now to be given are illustrative. In the example below, the contract provides for a general and administrative rate of 5 per cent applied at the engineering cost (cost of sales) level and a 10 per cent fee based on total cost (sales price). Division B realizes a recovery of only $110 for general and administrative expense and a profit of $12, because intracompany profit must be eliminated entirely in the billing to the sponsor. The figures follow:

	Multidivisional Company				*Customer*
	A		B		C
	Second-tier Div. (Lab. which does the work)		*Prime Contracting Div. (Contract Administrator)*		*Sponsor (for which the work is done)*
	$		$		$
Material and direct charges	100.		2,450.		
Labor	1,000.	Less Div. A's profit	(245)		
Overhead	1,000.		—		
Engineering cost	2,100.		2,205.		
General and administrative	105.		110.		
Breakeven cost	2,205		2,315		
Fee	245.		257		
Total cost billed to B	2,450.	Billed to C	2,572	Total Cost	2,572

When the above figures are presented in accepted profit and loss fashion with an intracompany subcontracting arrangement, as compared to having the subcontract performed by a research facility not associated with the prime contractor, the financial aspects are as follows:

	Statement 1		*Statement 2*			
			Consolidated		*Division B*	
	$	%	$	%	$	%
Sales	2,857.	100.	2,572.	100.	2,572.	100.
Cost of sales	2,450.	85.8	2,100	81.7	2,450.	95.3
Gross margin	407.	14.2	472.	18.3	122.	4.7
General and Administrative	122.	4.2	215.	8.3	110.	4.2
Profit	285.	10.0	257.	10.0	12.	.5

Statement 1 gives the financial picture for both the prime contracting Division B and the consolidated corporation when the subcontracting is done by an outside customer. Statement 2 presents the financial figures for the consolidated corporation and the prime contracting Division B when the subcontracting is done by another division of the same corporation.

The illustration shows how the financial picture can vary when sponsored research is done by a multidivisional company where intracompany profits must be eliminated, as compared to having the work done by an independent subcontractor. The salient factor, sometimes not considered by sponsors, is that the work is done more cheaply for the sponsor. The multidivisional corporation's gross sales and net profit are lower when the subcontracting is done by another division of the same corporation. This results from intracompany profit eliminations.

The cost of sales account on sponsored research may be composed of two major categories: work done by the prime contractor and work done by subcontractors. The second item is easily identified, because the underlying documents are monthly invoices submitted by the subcontractors. The invoices can be charged directly to a sub-account under cost of sales in the general ledger and by contract in the cost ledger. With respect to work done by the prime contractor, a shop (or work) order system to accumulate actual material, labor, and overhead costs must be utilized. A classified numbering system permits analysis of the project costs by type of customer and type of contract i.e., cost-plus-fixed-fee, fixed price, determinable price upon completion, renegotiable, etc.

Immediately upon issuance of a contract authorization which permits work to commence, a shop order is issued to accumulate all direct dollar costs incurred and hours expended by productive engineers and direct supporting personnel working on the project. The method followed is similar to any job order system. Overhead can be allocated to each project as a percentage of direct labor cost, primarily because much of the overhead cost is contingent on salaries paid and, secondarily, it is an expedient method of computing burden.

The total direct material, direct labor, and overhead represents the cost of sales on the project and the department that performed the work is given credit accordingly. In effect, a cost center is established for each field of endeavor. Departmental expense statements can be prepared to indicate the type of expense incurred and cost statements can be prepared to indicate the projects on which the costs were incurred. The difference between the two statement totals is the under/over absorbed burden. Costs incurred by one cost center on a project which is the responsibility of another cost center must be transferred so that comparable expense and research credits can be presented to evaluate the efficiency of the department.

Cost Ledgers Maintained for Prime and Sub-Contracts

What are the accounting tools used to accumulate and present these costs so that work and financial progress can be intelligently observed? Inasmuch as the effort on the contract can be segregated into two general categories, (work done by the prime contractor and work done by subcontractors), it appears best to maintain two separate cost ledgers.

SHOP ORDER COST LEDGER

APPROPRIATION: $ 00,000 — SHOP ORDER NO.: 33-133
COST CENTER: 33 — PURCHASE ORDER NO.: 1-070
DESCRIPTION: ELECTRONICALLY CONTROLLED GOLF BALLS — CONTRACT NO.: DA 53421-P
STARTING DATE: JANUARY 15, 1956
ENGINEER: R. M. HAZEL — COMPLETION DATE: DECEMBER 30, 1956

DATE	DIRECT MATERIAL AND OTHER EXPENSE	DIRECT LABOR				DIRECT OVERHEAD ALLOCATION	TOTAL DIRECT COST
		ENGINEERING		OTHER PRODUCTIVE			
	$	Hours	$	Hours	$	$	$
1-31-56	200	100	1,000	50	250	1,375	2,833
2-29-56	260	150	1,125	10	125	1,375	2,875
Year to Date	350	262	2,125	54	375	2,750	5,200
3-31-56	225	125	1,375	25	225	1,650	3,475
Year to Date	825	412	3,400	85	600	4,400	9,283

EXHIBIT 4

Exhibit 4 illustrates the type of ledger card used to accumulate all costs incurred and allocable on a cost-of-sales basis to the projects worked on by the prime contractor's personnel. This ledger is maintained by cost center and by shop order number. Monthly total costs incurred and recorded on this ledger are charged to a cost of sales account on the general ledger and credited to the

cost center responsible for the project. The difference between the total expense incurred by the cost center and the credits received indicate whether the section is or is not operating efficiently from a dollar viewpoint, providing the fixed charges have been correctly allocated. Individuals in charge of the cost centers be-

SUBCONTRACT LEDGER

SUBCONTRACTOR: FRAZER CORP.
LOCATION: 30 HAMPTON PLAZA
CARMEL, NEW JERSEY
THEIR REF. NO.: 693
DESCRIPTION: ELECTRONICALLY CONTROLLED
GOLF BALLS
STARTING DATE: MARCH 1, 1958
COMPLETION DATE: JULY 31, 1958

CONTRACT NO.: DA 53421-P
PHD LAB P.O. NO. OR CONTRACT NO.: 1-230
TOTAL APPROPRIATION: $ 3,000
MFG. COSTS: $ 1,714
G & A: $ 88
FEE: $ 200

DATE	MATERIAL	LABOR	MANUFACTURING OVERHEAD	G & A BURDEN	FEE	TOTAL COST
	$	$	$	$	$	$
3-31-58	130	181	230	9	20	550
Year to Date	250	381	280	9	20	730

EXHIBIT 5

come vitally interested in the charges allocated to their sections. Services requisitioned from one cost center by another must necessarily follow the credits given to the cost center to which the project belongs. Otherwise there is an interdepartmental distortion of expenses and credits.

CONTRACT LEDGER

PURCHASER: EZY LABORATORIES
ADDRESS: NEW YORK, NEW YORK
RENEGOTIATION ACT OF 1951: SUBJECT/NOT SUBJECT
STARTING DATE: JANUARY 15, 1958
COMPLETION DATE: DECEMBER 31, 1958

CONTRACT NO.: DA 53421-P
TYPE OF CONTRACT: CPFF
TOTAL AUTHORIZATION: $ 83,410
BREAKEVEN COST: $ 75,073
FEE: $ 8,341
WITHHOLDING PROVISIONS: 10% or $1,181.10, of fee

DATE	PHD LAB. DIRECT COST	SUBCONTRACT DIRECT COST	G & A BURDEN	FEE	TOTAL COST TO SPONSOR	OUTSTANDING COMMITMENTS (INCL. P.O.'S & SUB-CONT.)	UNEXPENDED OR UNCOMMITTED BALANCE
	$	$	$	$	$	$	$
1-31-58	2,833	—	148	331	3,308	2,192	77,918
2-28-58	2,975	—	149	347	3,471		
Year to Date	5,808	—	297	678	6,777	2,730	75,881
3-31-58	3,475	550	301	470	4,696		
Year to Date	9,283	550	492	1,148	11,473	3,389	68,560

EXHIBIT 6

Exhibit 5 illustrates the ledger maintained for subcontracted work. This ledger is mainained by project and by subcontractor. All invoices received for research assistance performed by subcontractors are recorded on this ledger by project and charged to a cost of sales account on the general ledger. No credit is given to cost centers for this work because it is not charged to them and they did not contribute directly to the task. It is essential that a close control be maintained on the appropriation and the expenditures of a subcontractor so that the work will be completed before the appropriation is exhausted. A percentage of the appropriation should be withheld until the task is completed in accordance with the subcontract. On the prime contractor's books, this reserve for withholdings is set up as payable to the subcontractor and is either billed to the customer or set up in a deferred billing status, or established as part of the withheld reserve on the prime contract, depending on the terms of the prime contract.

The Contract Ledger card, (Exhibit 6) is the document used to bring together the direct laboratory cost and the subcontract cost so that the general and administrative rate and fee can be applied to compute the total cost for billing purposes. This record also serves as an appropriation ledger, because the outstanding commitments on both subcontracts and purchase orders are posted monthly from the subcontract ledger and the Commitment Ledger (Exhibit 7). A complete picture of the costs, commitments, and remaining appropriation for the contract is thus presented by the contract ledger. This information is essential for preparing the contract status report, still to be mentioned.

COMMITMENT LEDGER ON PURCHASE ORDER

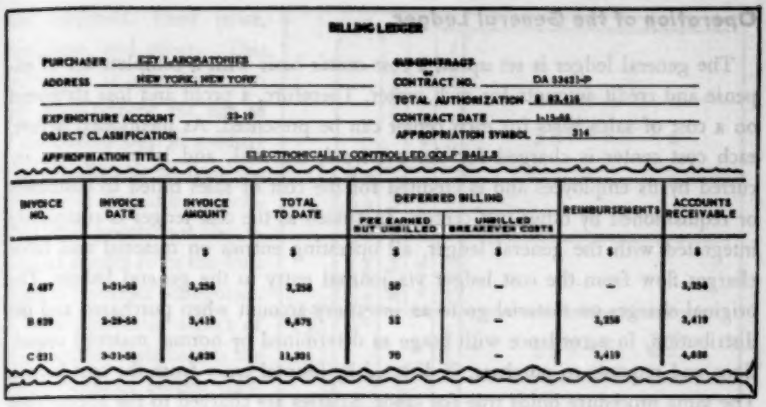
PHD LABORATORIES NO.: 1-939 STARTING DATE: JANUARY 15, 1958

CONTRACT NO.: DA 594421-P COMPLETION DATE: DECEMBER 15, 1958

DATE	TOTAL COMMITMENT	EXPENDED AMOUNT	UNEXPENDED BALANCE	DATE	TOTAL COMMITMENT	EXPENDED AMOUNT	UNEXPENDED BALANCE
	$	$	$		$	$	$
1-31-58	2,400	300	2,100				
2-28-58	2,510	150	2,750				
3-31-58	4,500	993	3,507				

EXHIBIT 7

A copy of each purchase order issued on every billable project is received by the cost function and, after posting, is filed in the commitment ledger, which is merely an 9" x 12" envelope maintained for each contract, with the ledger form reproduced on it. The dollar commitments outstanding on purchase orders are



BILLING LEDGER

PURCHASER: KEY LABORATORIES
ADDRESS: NEW YORK, NEW YORK
SUBCONTRACT OR CONTRACT NO.: DA 33431-P
TOTAL AUTHORIZATION: $ 83,410
EXPENDITURE ACCOUNT: 33-19
CONTRACT DATE: 1-15-58
OBJECT CLASSIFICATION:
APPROPRIATION SYMBOL: 214
APPROPRIATION TITLE: ELECTRONICALLY CONTROLLED GOLF BALLS

INVOICE NO.	INVOICE DATE	INVOICE AMOUNT	TOTAL TO DATE	DEFERRED BILLING		REIMBURSEMENTS	ACCOUNTS RECEIVABLE
				FEE EARNED BUT UNBILLED	UNBILLED BREAK-EVEN COSTS		
		$	$	$	$	$	$
A 487	1-31-58	3,256	3,256	50	–	–	3,256
B 839	2-28-58	5,419	8,675	52	–	3,256	5,419
C 231	3-31-58	4,836	13,511	70	–	5,419	4,836

EXHIBIT 8

reduced when invoices are received from the vendors and posted under "expended amount." When the contract is completed, the commitment ledger envelope, with all applicable purchase orders, is filed in the contract file so that a complete history of direct material and services purchased and used on the contract is available.

Cost-plus-fixed-fee contracts sometimes provide for withholdings on both estimated break-even costs and allowable fee, on a percentage basis pending completion and acceptance of the project. In addition, there may be a withholding provision in the patent clause pending submission of final patent disclosures and report of inventions, if any. These withholdings are set up as deferred billings and in order to maintain a close control on the contract completion reserve and the accounts receivable due for the sales billed to sponsors, a Billing Ledger. (Exhibit 8) is maintained. Segregating the unbilled fee and unbilled costs on the billing ledger facilitates final billing on the contract and gives an analysis of the general ledger account for deferred billings which has been charged when the income was earned and the costs incurred. Some ultraconservative accountants do not record fee earned until it is billed, but that practice, I believe, is a distortion of good accounting principles, because it does not properly present period earning. The deferred billing account can become a substantial amount if contracts are fixed-price, billable upon completion or on a technical progress report basis. Cost-plus-fixed-fee contracts for research and development today should include a progress payment clause which is based on costs incurred, with a percentage limit computed on the original estimated cost.

Operation of the General Ledger

The general ledger is set up on a cost center basis with a complete set of expense and credit accounts for each center. Therefore, a profit and loss statement on a cost of sales basis for each center can be presented. As mentioned before, each cost center is charged for the overhead, material, and labor expense incurred by its employees and is credited for the cost of sales billed to customers or requisitioned by other cost centers. Inasmuch as the cost ledger is completely integrated with the general ledger, all operating entries on material and labor charges flow from the cost ledger via journal entry to the general ledger. The original charges on material go to an inventory account when purchased and the distribution, in accordance with usage as determined by normal material requisitions and requests to purchase, is directed by journal entry from the cost ledger. The same procedure holds true for labor. Salaries are charged to the appropriate cost centers' various labor accounts through the payroll journal and the distribution to productive and overhead categories, as determined from project time sheets, is adjusted by journal entry from the cost ledger through contra labor accounts. Contra accounts are used so that basic salary account totals will not be disturbed and to permit comparison between actual and budgeted salaries for each cost center.

With respect to overhead, each cost center is credited with the billable overhead and the difference between that and the expenses charged direct to their overhead accounts on the general ledger represents the variance between actual and absorbed overhead. The variance is transferred into the cost of sales account when the books are closed at the end of the accounting year.

Billed research (representing cost of sales, general and administrative expense and fee) is charged to accounts receivable and credited to sales accounts set up by type of contract. The difference between the sales and cost of sales on the top profit and loss statement naturally represents the gross margin on sponsored research. General and administrative expense recovery is not carried back to the administrative departments' statements of expense, but periodic percentage allocation tests should be made when fixed overhead rates are negotiated or used for a protracted period.

Profit and Loss Statements for Sponsored Research

Exhibit 9 illustrates the type of profit and loss statement prepared directly from the control accounts in the cost ledgers. It presents the salient factors with respect to the profits resulting from the company's own research personnel and subcontracted work and also breaks down the effort between cost-plus-fixed-

fee contracts, fixed price, cost type, and others. This statement is distributed to top management for use as a directional sign in guiding the decisions as to how the work load should be distributed and points out the financial results from the four general contract categories. A most important aspect of this monthly statement is the presentation of budget comparisons so that aggressive action may be instigated when warranted.

A Sponsored Research Status Report (Exhibit 10), should be prepared each month for each active contract. This statement is a working report for the administration group and informs it of the financial position of the individual contracts, so that proper action can be taken to see that the work progresses in accordance with the budgeted dollar expenditures. The status report will reveal whether additional funds may be necessary or whether the work effort should be curtailed or realigned.

Most sponsors will call for a periodic (monthly) report of commitments and

PROFIT AND LOSS - SPONSORED RESEARCH, MARCH 31, 1956

	GRAND TOTAL		PHD LABORATORIES EFFORT (Work Done For Others)								SUBCONTRACT EFFORT (Work Others Do For Us)							
			TOTAL		INTRA COMPANY				OTHERS		TOTAL		INTRA COMPANY				OTHERS	
					CPFF		FP		CPFF	FP			CPFF		FP		CPFF	FP
	ACTUAL	BUDGET	ACTUAL	BUDGET	ACTUAL		ACTUAL		ACTUAL	ACTUAL	ACTUAL	BUDGET	ACTUAL		ACTUAL		ACTUAL	ACTUAL
	0	0	0	0	0		0		0	0	0	0	0		0		0	0
YEAR TO DATE																		
Sponsored Research:																		
Sales	11,473	10,510	10,830	9,527					10,830		643	588					643	
Expense	9,633	9,000	9,383	8,500					9,383		550	500					550	
Gross Margin	1,840	1,510	1,447	1,027					1,447		93	83					93	
G & A Applied	692	458	684	434					684		28	25					28	
Operating Margin	1,148	1,051	1,083	993					1,083		65	58					65	
Per Cent Of:																		
Sales	10.0	10.1	10.0	10.0					10.0		10.0	10.0					10.0	
Breakeven Costs	11.1	11.1	11.1	11.1					11.1		11.1	11.0					11.1	
THIS MONTH																		

EXHIBIT 9

SPONSORED RESEARCH STATUS REPORT

SHOP ORDER NO.: 33-122 — SECURITY CLASSIFICATION: CONFIDENTIAL

PROJECT ENGINEER: R. M. JOHNSON — BILLING FORMULA: TOTAL BREAKEVEN COST

CONTRACT REPRESENTATIVE: J. DOE — WITH 85% LIMITATION. 85% OF FEE EARNED.

CUSTOMER: EZY LABORATORIES

PROJECT: ELECTRONICALLY CONTROLLED GOLF BALLS — SUBCONTRACTORS: FRAZIER CORP — $2,000

TOTAL AUTHORIZATION: $83,418

ACTUAL MONTHLY EXPENDITURES AND COMMITMENTS

DATE	MAN MONTHS	DIRECT COST	BREAKEVEN COST	TOTAL COST	OUTSTANDING COMMITMENTS		UNEXPENDED BALANCE	EARNED INCOME	ACCOUNTS RECEIVABLE	WITHHOLDING	
					SUBCONTRACT	PURCHASE ORDERS				BREAKEVEN COST	FEE

EXHIBIT 10

expenditures in order to correlate the expected expenditures with the technical progress of the work. They are then able to make funds available to permit uninterrupted progress and can better determine their needs, for budget planning reasons. In most instances, they will require a segregation of the monthly expenditures between recurring and nonrecurring charges so they will be in a position to evaluate properly the total funds required. This sponsored research status report, then, is a most important tool in the administration of contracts and, even though it may appear to be an arduous task when there are numerous contracts on the books, the preparation is not too difficult if the cost ledgers are set up to provide the information. It is merely a matter of transcription.

Monthly analyses of accounts receivable by contract number and in summary by customer, weighed from a current, 30-day, 60-day, 90-day and over, and withheld standpoint, is prepared directly from the billing ledger. This monthly analysis must be prepared in order to keep a firm hand on the accounts receivable so that the balloon does not become inflated with the company's working capital. When dealing with governmental agencies, where resident cost inspectors, cognizant cost inspectors, contracting officers, material inspectors, property inspectors, finance officers, and finally the general accounting office becomes involved with

lapsed appropriations, it can develop that remittances are not forthcoming as quickly as one might desire. Therefore, it is advisable to watch the flow of vouchers and remittances carefully and maintain a close control on accounts receivable.

In addition to the statements mentioned, monthly summaries of cost by project at research level, cost forecasts and, of course, on government contracts, a year-end report under the Renegotiation Act of 1951, and otehr statements must be prepared. It appears to this writer that there is no need to cover such reports in this presentation. If the cost ledgers are set up properly, it is only a matter of extracting and presenting totals in statement form.

A New Profit-Making Enterprise

A review of the annual reports of many large public-owned corporations will reveal that a very substantial portion of their sales is represented by products not in existence five years ago. Yet some people seem to shy away from mentioning the word "profit" in connection with "research." What is wrong with coupling them together? It appears to me that the ultimate end of research is profit, and sponsored research is one means of recognizing the end sooner.

Sponsored industrial research is a relatively new, growing business which has individual accounting problems. Capital and revenue differentiation is just as difficult and as important in the research endeavor as in any other line of business endeavor. However, if good accounting principles and business sense are applied and the proper mix of research engineers and facilities is available, there is little doubt of success.

WE FOLLOW UP OUR CAPITAL OUTLAYS

by Keith J. Bowman*

SINCE STUDIES SHOW that few corporations have a formal follow-up program for capital expenditures, it may be interesting to briefly review the approach of our company to this problem. Like most firms of any size, we have a formal procedure for the authorization of capital expenditures, including an established method of calculating and presenting prospective return on investment (whenever the project is one which will create measurable financial benefits). Beyond this we have an audit and follow-up of projects which is conducted by the accounting personnel at the plant or division level at which the request originated.

* Plant Accountant, Corning Glass Works, Corning, New York.

The audit date is established at the time the proposal is submitted for management approval. The following outline gives the captions used in preparing information for the audit report to our controller's department:

1. Title and project number.
2. Brief description.
3. Expenditure planned vs amount spent.
4. Planned vs actual capital involved.
5. Planned vs actual completion date.
6. Planned vs actual pay back time.
7. Planned vs actual return on investment.
8. General analysis of the project.
   a. Explain project overruns or underruns of more than 10%.
   b. Give reasons for substantial variations in return on investment.
   c. Was the project a technical success? If not, discuss.
   d. Is the equipment still in use and does its actual prospective life equal its originally forecast life?
   e. Analysis by sales manager if product under sales goal.
9. What did we learn from this project that would help us improve our performance on future projects of this nature?
10. Who developed the information for the original request?
11. Who participated in this review?
12. Who maintains the master file on the entire project?

The audit reports of the various projects are submitted to our controller's department. We have derived and are continuing to derive many improvements in our choice of investments through these reviews and audits. Some improvements which have resulted from project analysis may be cited:

1. Experience gained from the study of completed projects has revealed areas of weaknesses which are enabling us to more wisely invest.
2. There has been considerable improvement in product specification data furnished by sales personnel to technical groups responsible for producing equipment.
3. Since sales personnel *are* responsible for sales data, a greater sense of responsibility on their part has resulted in better market-potential data, with more accurate forecasts of the time required to penetrate established markets.
4. Improvement in the preparation of proposed projects has resulted, with more consideration given to alternative methods and more accurate financial forecasting.
5. A vast improvement has been noted in the evaluation of projects proposed by the various plants, before formal submission to management.

By placing emphasis on good planning and by making the performance audits the responsibility of the planners, we believe we are improving our capital investments and ultimately our profits.

Beyond These Covers

Books

Sampling Techniques in Accounting

Robert M. Trueblood and Richard M. Cyert, Prentice Hall, Inc., Englewood Cliffs, New Jersey, 1957, 211th, $7.50.

A "first" (as a full-length publication on its specific topic), this book is likely to be welcomed for crystallizing thinking in an area which has been explored for a number of years in papers and articles. The forepart of the volume is devoted to statistics and evaluation of their use in auditing, the remainder (and greater part) to applications.

Work Simplification

Gerald Nadler, McGraw-Hill Book Co., 330 West 42nd Street, New York 36, N. Y., 1957, 292 pp., $6.50.

A methods book, this text embodies the author's contention that work simplification is widely applicable, both in and beyond industry. Forms and charts are numerous but they do not cut down on explanatory text. Analytical technique and systems installation are both treated.

Linear Programming

Dakota Ulrich Greenwald, Ronald Press Co., 15 East 26th Street, New York 10, N. Y., 1957, 75 pp., $3.00.

If the subtitle, "An Explanation of the Simplex Algorithm" baffles, perhaps note may be taken of the brevity of the present book and its inclusion of such relevant topics as those of "formulation of the product-mix problem" and "the problem of distribution costs." Problems in other similar areas are used illustratively.

11th Annual Conference of Accountants

University of Tulsa, (Oklahoma), 1957, 121 pp.

Published here are papers given at the University of Tulsa's 1957 Accounting Conference held last April. Considerable diversity characterizes these addresses. Among the dozen topics considered were statistical techniques, by-product costing, accounting administration, decentralized operations, and integrated data processing.

Activities and Services of the Federal Government in Distribution Research

U. S. Department of Commerce, Washington 25, D. C., 1957, Paper Bound, 60 pp., 40¢.

The Commerce Department queried all other "major agencies of the Federal Government" to compile the material listed in this bibliography-type publication. It serves as a tracer to government-published material on trade data and industry studies in the distribution area and is followed by an appendix listing "government statistical publications useful in distribution."

Articles

Generally Accepted Principles of Accounting

George O. May, Journal of Accounting, January 1958.

Incidental to tracing the origin and use of a keystone phrase in accounting practice and literature in America, the author of this article inadvertently provides a "sense of history" in his discussion of the topic, for his means of discussion are related to past experience applicable to various points in his career and this experience had its inception before 1900.

Towards a General and Axiomatic Foundation of Accountancy

Richard Mattessich, Accounting Research, October 1957.

Mathematical expression of accounting fundamentals is essayed here—at least a beginning. Accountancy is taken to include both business accounting for individual enterprises and social accounting for aggregates of such enterprises.

Cost Relationships—A Package Theory

E. E. Rennback, The Controller, December 1957.

"Cost packages may be defined as units in which goods and services are purchased." Following this definition, the author of this article examines variability, controllability and directness of costs, fortifying his article by some novel diagrams of cost relationships over time and production.

Today's Depreciation Deduction

Raymond E. Graichen, Journal of Accountancy, December 1957.

Selection of the preferable depreciation method for tax purposes is subject matter of this article, which deals also with the various rules under which the available methods are administered.

Decentralized Operations—A Control Problem

William L. Strong, The Controller, January 1958.

A profit and loss statement for "independent operations located over a wide geographical area" is central to this article. Apparently a return on investment figure is a standard inclusion in the notes to this statement.

Use of Rate of Return on Investment

Othel D. Westphal, Advanced Management, January 1958.

A study in application of return on investment measurement to the problem of optimum location for a new plant, this article includes examples of estimates carried ahead over a twenty-five year period.

The Use of Management Yardsticks for Capital Expenditure Decisions

Edward G. Koch, The Controller, January 1958.

Likely payout period and projected return on investment are measures utilized in the procedure here described to establish "pars" for "planning and controlling capital expenditures."

The Results Approach to Profitable Management

Edward C. Schleh, Dun's Review and Modern Industry, January 1958.

Responsibility for "results" as presented in this article, can be a measurement in dollars or other use of digits, such as ratio. The paper is devoted to illustration of the practicability and, on occasion, virtual necessity of application of such measurements to executive performance.

Profitability Indexes for Capital Investment

Joel Dean, The Controller, February 1958.

Four "candidate" yardsticks of capital investment desirability are discussed in this article. They are: necessity-postponability, payback period, level book rate of return. In terms of requirements which the author lists, the last-named "makes an almost perfect score." Application of investment yardsticks is the final subtopic of the author.

Distribution Cost Analysis

Michael Schiff, Journal of Accountancy, February 1958.

Approached here as "a service to marketing management," analysis of distribution costs is related to functions, products and channels and is accompanied by tables illustrating allocations to achieve this.

Union Welfare Funds

Raymond Buchbinder, New York Certified Public Accountant, February, 1958.

A fourteen page article of substance dealing with the legal responsibilities of funds, their transactions, and relationships. This paper, on a timely topic, is written for the assistance of the external auditor but is also a presentation of general interest.

Audits of Federal Credit Unions

Arthur G. Hendricks, Journal of Accountancy, February 1958.

Noting the increase in numbers and usefulness of Federal credit unions, the author of this article proceeds to a consideration of their basis in Federal law and the reflection of their principal transactions in the accounts.

Accounting for Doctors

Edwin A. Jarrett, The Canadian Chartered Accountant, February 1958.

Individual medical practitioners, partnership arrangements, and clinic organization accounting are touched on here, with specific recommedations as to necesary records and methods of keeping them.

Planning New Plant Location and Construction

Robert A. Fratus, The Controller, February 1958.

Devoted largely to more or less "imponderable" considerations in the locating of new plant and its erection, this article, nevertheless, touches at almost all points in the area which might possibly be "enclosed" in a financial analysis of alternative choices.

Automation and the Office

Wilbert E. Scheer, Office Executive, January 1958.

One of a group of articles in the same area, comprising the indicated issue of the *Office Executive* and reporting a 1957 conference held at Hartford, Conn., this paper constitutes a comprehensive introduction to over-all implications of office automation.

ADDRESSES OF PERIODICALS

Accounting Research

Cambridge University Press, 32 West 57th St., New York 22, N. Y. Single copy $1.25 (plus postage).

Advanced Management

74 Fifth Ave., New York 11, N. Y. Single copy $1.00.

Canadian Chartered Accountant

69 Bloor St. E., Toronto 5, Ontario, Canada. Single copy, 60¢.

The Controller

2 Park Ave., New York 16, N. Y. Single copy, 60¢.

Dunn's Review and Modern Industry

99 Church St., New York 8, N. Y. Single copy 75¢.

Journal of Accountancy

270 Madison Ave., New York 16, N. Y., Single copy, 85¢.

New York Certified Public Accountant

677 Fifth Ave., New York 22, N. Y. Single copy 50¢.

Office Executive

1927 Old York Road, Willow Grove, Penn. Single copy 50¢.